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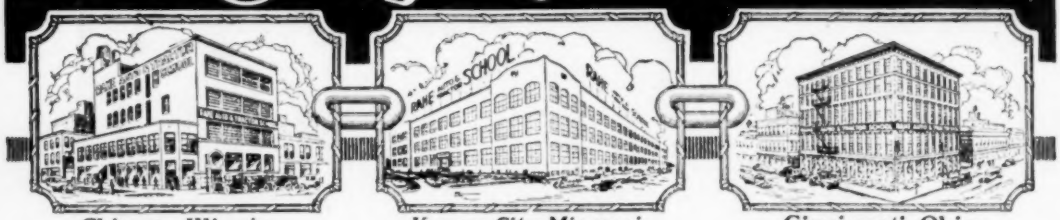
# POPULAR MECHANICS MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND IT

SEE PAGE 177

# Now 3 Big Rahe Schools



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# I have brought the Rahe-Way OF AUTO & TRACTOR TRAINING to YOU

**OPPORTUNITY** *is now hundreds of miles closer*

**MONEY MONEY *more* MONEY**

**Thousands of men come or write to me—**

*"How can I make more money! I want a better job—more pay—a bigger future."*

I answer them—"Know how to do some one thing well. Be a trained man. Learn by actually doing, under competent instructors, the work you would like most to do. Become an expert in the best paying business today—the Auto Service Business."

Come to a RAHE School. Learn Auto Mechanics *thoroughly*. Qualify for BIG MONEY Jobs. Don't delay. Write for my 68-page catalog. Write TODAY.

NOW you have the choice of THREE BIG RAHE SCHOOLS. I have established the famous RAHE-WAY of Automotive Training in Chicago and Cincinnati, as well as at Kansas City. To thousands of young men, OPPORTUNITY now is hundreds of miles closer—as near as Chicago or Cincinnati.

## Hundreds Train at Cincinnati

For 14 years I have been teaching Auto and Tractor training at Kansas City. The great success of my school meant I must expand—add more floor space or establish new schools. Why not, I thought, take Automotive Training to the thousands of men who could not come to Kansas City? My idea proved sound. The Cincinnati School has been a big success from the day its doors were opened. From the Eastern, Southern and Central States, hundreds of students have poured into Cincinnati.

## Chicago School is Popular

Now the Chicago School is going full-blast. It is a full-fledged, independent institution, teaching the famous RAHE-WAY, equipped just the same as the other RAHE Schools. Already hundreds of students are in training. Hundreds and thousands more are coming. Why?

**This Is an Automotive Year.** More money is being spent this year than last for auto and tractor upkeep and repair. THREE BILLION DOLLARS this year to keep autos running. You can have a big part of this $3,000,000,000 if you train yourself the RAHE-WAY—the Practical Job Method of teaching Automotive Mechanics.

**This Big 68-page Book describes the Rahe-Way** —tells how thousands have learned Automotive Training. Shows how Big Money is made. It is FREE to you. Write today. Clip the Coupon and send for it now.

You can **Make $150 to $400 a Month.** RAHE Graduates everywhere are making Big Money. This is YOUR opportunity to BREAK AWAY from LOW PAY. Clip the Coupon and send today. It will be one of the most fortunate things you've ever done.

**HENRY J. RAHE,** **Dept. 2898**

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**CINCINNATI, OHIO, 9th and Walnut Streets**
*(Send to Nearest Address)*

Please send me your 68-page Catalog showing graduates' success and opportunities now open.

**Name**..... **Occupation**.....

**Address**..... **Age**.....

# PRIZE OFFERS

## CASH PRIZES OFFERED FOR NEEDLEWORK BY STAR NEEDLEWORK JOURNAL

Cash prizes to the amount of $2,000 are offered for crochet, tatting, knitting, and embroidery work by the Star Needlework Journal. The contest is limited to work done with cotton thread made in America. All articles submitted must be specially made for this contest. Securely sewn to the article submitted must be a coupon which is part of a circular that contains full particulars of the many classes of work for which in each case a number of prizes are offered, varying in value from $100 to $1. In addition to these regular class prizes, three special prizes will be given, one of $200 for the best piece of work entered in the contest, one of $100 for the best original design in colored work, and one of $100 for the best original design in white work. Competitors may enter in as many classes as desired, but will receive only one prize except those who are winners of special prizes. Work should not be sent in before December, 1921. The contest closes Jan. 31, 1922. For circulars and entry blanks, address Star Needlework Journal, 260 West Broadway, New York City.

## THE SKETCH, OF LONDON, ENG., OFFERS £100 FOR BEST ANSWERS TO THREE QUESTIONS

In the current issues of The Sketch, the well-known illustrated paper published in London, Eng., there is offered a prize of £100 for the best answers to the three questions: "What feature in The Sketch do you like best?" "What feature do you like least?" "What feature not at present published in The Sketch would you like to see introduced?" Each set of answers is to be written on a sheet of paper and signed with a pen name, accompanied by another sheet of paper bearing the pen name and the actual name and address of the contestant. The contest is open to everyone, whether a reader of The Sketch or not. Answers must reach The Sketch office, 15 Essex St., Strand, London, W. C. 2, before Jan. 1, 1922.

## ONE MILLION FRANCS FOR BEST MOTOR OFFERED BY AERO CLUB OF FRANCE

The aviation commission of the Aero Club of France has now under consideration the rules that will govern a contest for a prize of one million francs (normally $200,000), which it offers for the best motor, produced before June 1, 1923, for service on commercial airplanes. The prize will be given to the designer of the motor that proves to be the most durable, the most reliable, and the simplest and easiest to assemble and disassemble.

## PRIZE FOR BEST SLOGAN DESCRIBING DURHAM DUPLEX RAZOR

Every storekeeper handling Durham duplex razors has blanks for distribution to all applicants in connection with a prize of $500 offered by the razor company for the best slogan of five words or less describing the shaving qualities of the razor. The contest will last until June 30, 1922. Blanks can be obtained also direct from the Durham Duplex Razor Co., 190 Baldwin Ave., Jersey City, N. J.

## PRIZES FOR GEORGE WASHINGTON ESSAYS OFFERED STUDENTS OF FIVE STATES

With the object of encouraging a careful study of the life of George Washington, the Chicago Tribune offers a number of prizes, totaling $11,650, for the best essays of 250 words or less upon that subject. The contest is open to every boy and girl attending grammar or high school, parochial, or private school in the city of Chicago, or in the states of Illinois, Indiana, Iowa, Michigan, and Wisconsin. The writer of the best essay submitted will receive $2,500 in cash. Sixty other prizes ranging from $500 to $25 will be paid for the best essays submitted from the six territorial divisions mentioned above, in each case as follows: first prize, $500; second, $250; third, $100; fourth to tenth, $25 each. There are also 18 cash prizes for teachers whose students submit the winning essays, as follows: in each of the six territories, $250 to the teacher whose student wins the first prize; $150 for the second prize, and $100 for the third prize. All essays must be original. In case of ties, the full sum offered will be paid to each winner. The contest is now open, and will close at midnight of Washington's birthday, Feb. 22, 1922. Address: "Essays," The Chicago Tribune, 7 South Dearborn St., Chicago, Ill.

## A BUNGALOW AS A CHRISTMAS PRESENT OFFERED IN NOVEL PRIZE CONTEST

A $5,000 bungalow, as a Christmas present, was recently offered by the Leiter Building Stores, Chicago, Ill., in a contest of quite a novel nature. A four-room bungalow was erected inside the store, and the contestant was required to describe the best manner of expending $2,000 in furnishing it completely with goods shown anywhere in the Leiter Stores. Everyone entering the contest had to call at the bungalow for an instruction sheet. Certainly every contestant would have to make a very thorough inspection of the goods displayed throughout this extensive department store, and doubtless the owners' recompense was this novel method of advertising their wares.

## CONTESTS PREVIOUSLY ANNOUNCED

**Students of Railroad Engineering:** Scholarships; announced March issue, 1920; closes Dec. 31; offered by the Southern Pacific.

**Essays on the Life of Roosevelt:** Scholarship prizes valued at $1,000, $750, and $500; announced August issue, 1920; closes Dec. 31; address, Woman's Roosevelt Memorial Association.

**New Methods of Testing Hardness of Metals:** Prize $1,000; announced October issue, 1920; closes Jan. 1, 1922; address, Institution of Mechanical Engineers, London, England.

**Essays on Economics:** Prizes, $1,000 and $500; announced June issue, 1921; closes Dec. 31; address, Dr. Wm. T. Foster, Newton 58, Mass.

**Medals, Diplomas, and Money Awards:** Announced August issue, 1921; awards offered by the Franklin Institute.

**For Service to City of Philadelphia:** Prize $10,000; announced September issue, 1921; awarded in spring or summer of 1922 by Edward Bok, former editor of The Ladies Home Journal.

**Orchestral-Composition Contest:** Prize $1,000; announced September issue, 1921; closes, Jan. 1, 1922; address, Carl D. Kinsey, 624 S. Michigan Ave., Chicago, Ill.

**Safety-First Essays:** Prizes, a trip to Washington and gold watch, a gold loving cup, a silver loving cup, and other state prizes; announced September issue, 1921; closes late in the fall; address any public-school teacher.

**Essays on Cruelty of Trapping:** Prizes, $100, $75, $50, and 2 special prizes, $50 and $25; announced Oct., 1921; closes Dec. 31, 1921; address, American Humane Association, Albany, N. Y.

**Research Thesis by a Woman:** Prize $1,000; announced October issue, 1921; closes Feb. 25, 1922; address, Dr. Lilian Welsh, Goucher College, Baltimore, Md.

**Model in Clay by Students of Chicago Art Institute:** Prizes, $1,000, $100, and $50; announced November issue, 1921; closes April 15, 1922; address, Daily News Office, 15 N. Wells St., Chicago, Ill.

**Best Stories of Infantry Platoons in Late War:** Prizes, $100, $50, $25, and $15; announced November issue, 1921; closes Dec. 31, 1921; address, Army and Navy Journal, New York City.

**Best Short Stories:** Prizes, 10 of $100 each; announced November issue, 1921; closes Dec. 31, 1921; address, True Stories Magazine, New York City.

**Pulitzer Prizes and Scholarships to be Awarded Annually:** Announced December issue, 1921; address, Secretary of Columbia University, New York City.

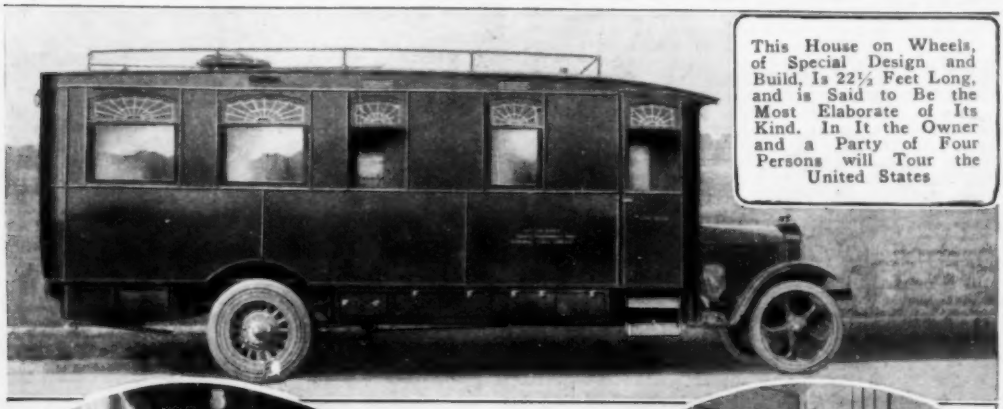
**Best Canadian Novel and Story:** Prizes, $2,500, and $500; announced December issue, 1921; closes June 1, 1922; address, Hodder & Stoughton, Limited, 263 Adelaide St. West, Toronto, Can.

**Best Stories of Adventure on Naval Vessels in the War Zone:** Prizes, $100, $50, $25, and $15; announced December issue, 1921; closes Jan. 31, 1922; address, Army and Navy Journal, New York City.

¶ Postmaster-General Hays has issued orders that the resources at the command of every postmaster in the United States shall be placed at the disposal of persons in search of missing relatives or friends. In future anyone will receive all possible assistance in tracing missing men, women, or children, by applying to the postmaster of his district.

¶ A party giving the name of J. Adams, claiming to represent the Magazine Service Co., of Chicago, is offering an atlas free and a year's subscription to this magazine at a cut rate. The Magazine Service Co. and its agents are frauds so far as having any authority to represent this magazine is concerned.

## ELABORATE HOUSE ON WHEELS FOR COUNTRY TOURS



This House on Wheels, of Special Design and Build, Is 22½ Feet Long, and is Said to Be the Most Elaborate of Its Kind. In It the Owner and a Party of Four Persons will Tour the United States

The Sleeping Compartment, Showing the Berth at the Left Ready for Occupancy, While the One at the Right is Shown Made Up for Day Travel: In the Ceiling can be Seen the Electric Fixtures

The Kitchen, Showing the Cabinets, or "Pantry," at the Right, and the Gasoline Stove, Which is Placed before the Window to Provide the Best Light and Ventilation, at the Left

An elaborate house on wheels, containing many modern conveniences, has recently been completed. The house, or body, which is built upon a five-ton motor-truck chassis, is 7½ ft. wide, and the roof is 10 ft. from the ground. All the windows are of French plate glass, and fitted with copper screens. A porch slides from beneath the body at the rear and may be covered with an awning. The driver's compartment is a combination seat and bed, and an aisle runs from it to the rear. Off the aisle is a bathroom with modern plumbing fixtures, and a kitchen fitted with a gasoline stove, electric grill, sink, refrigerator, and hot and cold water. In the rear is a combination living and sleeping room, with four folding berths.

**IN accordance with the editorial policy of this magazine never to accept compensation in any form for what appears in our reading pages, and also to avoid all appearance of doing so, we are obliged to omit the name of the maker or the seller of any article described. This information, however, is kept on file and will be furnished free, by addressing Bureau of Information, Popular Mechanics Magazine, Chicago. [Editor.]**

# Popular Mechanics Magazine

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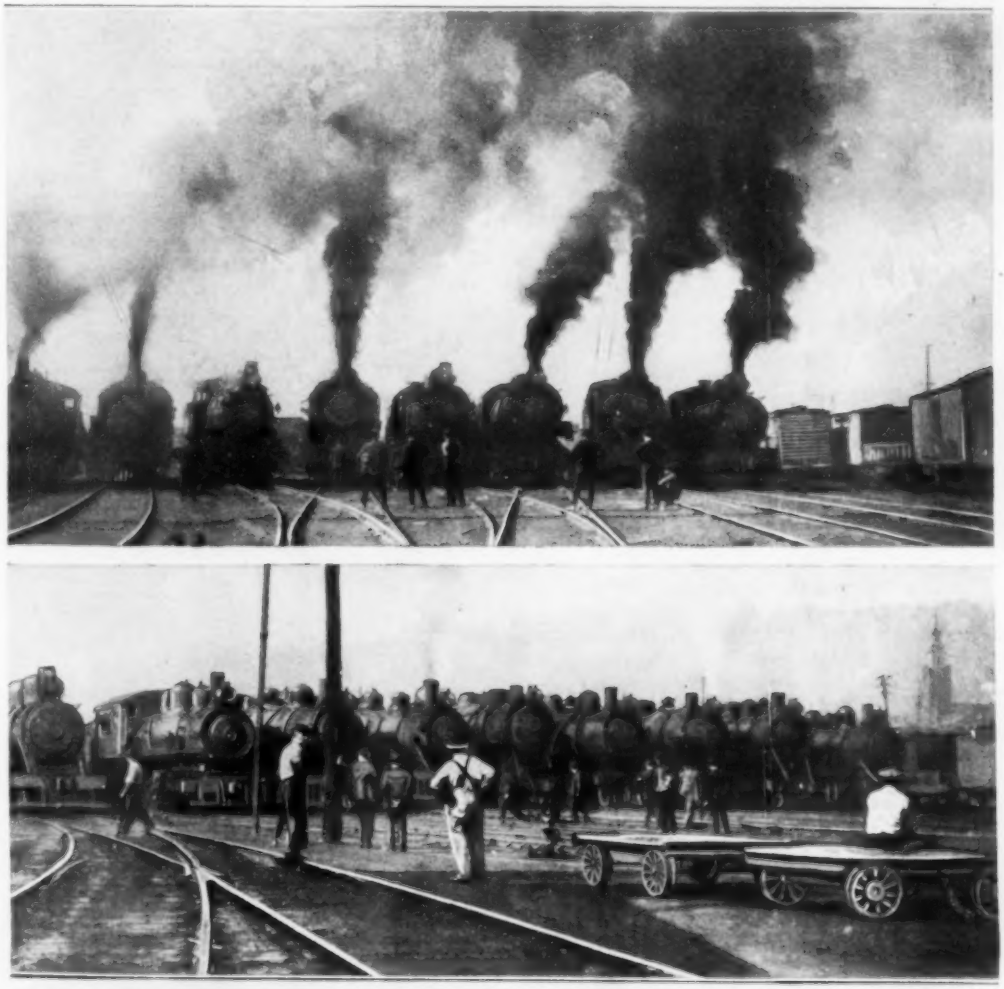
WRITTEN SO YOU CAN UNDERSTAND IT

Vol. 37 FEBRUARY, 1922 No. 2

## Smokiest Locomotives Made Smokeless

A PICTURE taken before and another taken after the application of a remedy are common in connection with advertised nostrums, but quite unusual in the matter of mechanical improvements. Probably for the first time in the history of railroading two pictures of this kind—and moving pictures at that—were taken of 50 locomotives lined up in the Baltimore and Ohio Railroad yards, at Cincinnati, the first one showing the locomotives belching from their funnels dense clouds of smoke, and the second one, after the application by the engineers of smoke consumers, showing an almost total absence of smoke of any



The Upper Picture Taken before, and the Lower One after, the Application of Smoke Consumers by the Engineers on 50 Locomotives That were Lined Up in the Yards of the Baltimore and Ohio Railroad, at Cincinnati, for the Purpose of having the Great Difference Shown Photographically

kind. It was a contrast equivalent to the difference between day and night. Smoke consumers on the locomotives are compulsory on all trains entering Cincinnati. It has been demonstrated there that they result not only in smoke prevention, but also in fuel economy. The moving pictures of this demonstration will be shown all over the country as propaganda in the interests of smoke prevention.

## BANJO FOR DANCE ORCHESTRAS THROWS SOUND FORWARD

A new banjo is specially designed to meet the requirements of dance orchestras, stage performances, and playing in large halls. The sound from an ordinary

Left: Banjo with Sound-Throwing Horn. Right: Outer Sounding Board Removed from Instrument to Show Construction

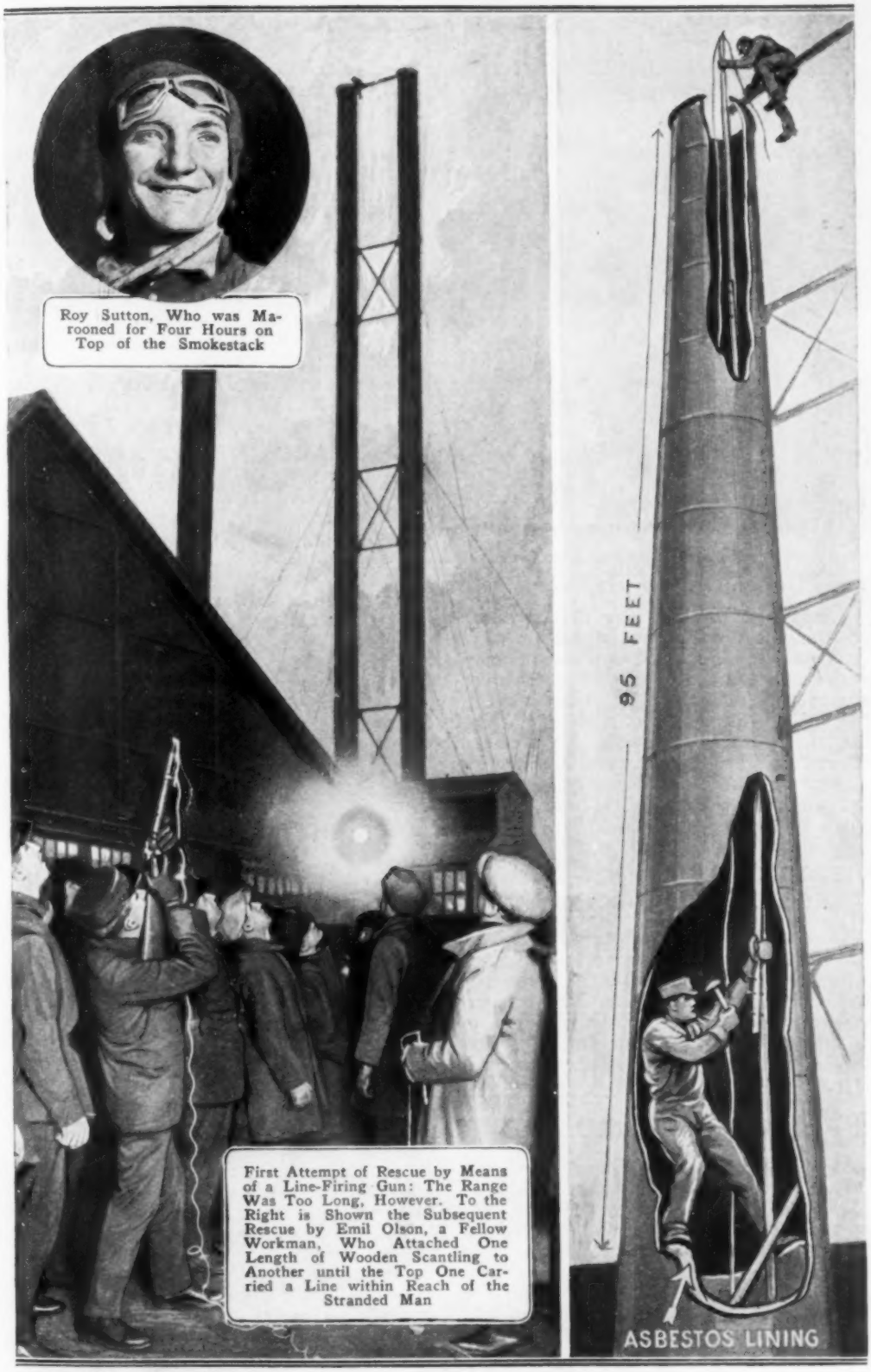
banjo is thrown back from the head against the body of the player and much of it is deadened in this way. The new banjo has a wooden sounding board set just back of the head. A horn, opening from the space between the head and sounding board, passes through the frame of the instrument and throws the entire volume of sound forward into the hall. A second board covers the back of the instrument. This not only increases the volume of sound but, by variations in construction, the quality of tone can be controlled to suit special purposes.

## RABBITS AS A PROTECTION FROM MOSQUITOES

Careful observations have been made, in France, of the extent to which mosquitoes are attracted to domestic animals in preference to human beings. It was proved experimentally that mosquitoes have a strong predilection for the blood of rabbits, stronger than for that of any other domestic animal. This discovery has been practically applied in many parts of France as a protection from mosquitoes, and particularly from those that carry germs of malaria, and similar diseases. In many parts of France now the inhabitants raise rabbits in conjunction with poultry, and thus protect themselves profitably against the dangers of disease-bearing mosquitoes.

## CLEVER RESCUE OF WORKMAN MAROONED 150 FEET IN AIR

While repairing, single-handed, the top of a smokestack, 125 ft. above the roof of a 30-ft.-high building in the plant of the American Bridge Company, Chicago, the workman let drop the line which was his only means of returning to the roof, and thence to the ground. There was no possibility of conveying a line to that height with any appliance in the plant, and so appeal was made for help from the fire department, which has a line-throwing gun, in appearance exactly like a military rifle, for use in such an emergency. Several futile attempts were made to fire the line within reach of the marooned workman, and finally this method of rescue had to be abandoned. Fortunately, as the stack had not been in use, it was cold, and finally a fellow workman climbed from the level of the roof up the first 30 ft. of the inside of the stack, to which height it was lined with asbestos. On a 3-in. steel ring, on top of the asbestos, the rescuer stood, with his legs astride the stack. In the meantime some long, light wooden scantlings, that had been cut and drilled for templates, as used in all structural work, were obtained and passed up to him. He pushed upward, first one of these scantlings, to the top of which a line was made fast, and to the bottom of that scantling he attached, with the aid of the holes, another, and so on, scantling after scantling, until the top one came within reach of the stranded workman. This did not happen until the poor fellow had spent four hours in his perilous position, 150 ft. above ground, in the frosty December atmosphere. Once he grasped the end of the line, it was a matter of only a few minutes before he had hitched it to the top of the stack, and slid down to safety.




Roy Sutton, Who was Marooned for Four Hours on Top of the Smokestack

First Attempt of Rescue by Means of a Line-Firing Gun: The Range Was Too Long, However. To the Right is Shown the Subsequent Rescue by Emil Olson, a Fellow Workman, Who Attached One Length of Wooden Scantling to Another until the Top One Carried a Line within Reach of the Stranded Man

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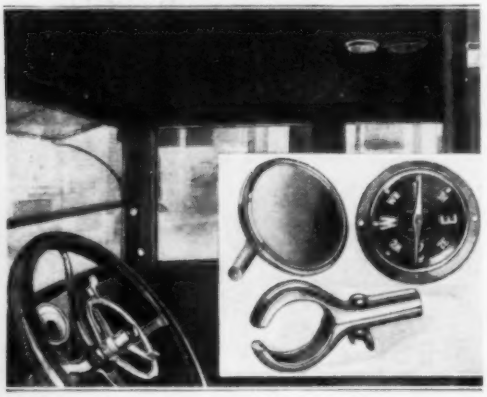
## COMPASS MOUNTED IN TOP OF AUTOMOBILE

Though marine compasses have been successfully used on automobiles, difficulty has always been experienced in installing



The Compass is Mounted in the Top of the Car and the Mirror on the Steering Column. The Separate Parts are Shown in the Insert

a compass in such a way that it would not be affected by the engine or other steel parts. A special automobile compass has now been developed which overcomes this difficulty. It is attached to the top of the car, about 24 in. back of the windshield and over the driver's head. A small mirror is mounted on the steering column in such a position that the driver can see in it the compass dial and read it without moving his head.

## HISTORIC DOCUMENTS PLACED IN LIBRARY OF CONGRESS

The original manuscripts of the Declaration of Independence and the Constitution of the United States were recently removed from the State Department building and placed in the Library of Congress. The fireproof building and special facilities of the library make it a safer and better place to preserve and exhibit these historic documents. They have been officially in the custody of the State Department since it was created by the act of Sept. 15, 1789, though on a few occasions they have been kept elsewhere. Thus, just before the capture of Washington by the British, in 1814, they were hidden in a grist mill near Leesburg, Va. In 1841, the Declaration of Independence was placed in the new Patent Office, which was then a part of the State Department, because its new building was supposed to be fireproof, and remained there till 1877, except for nine months, when it was in Independence Hall at Philadelphia.

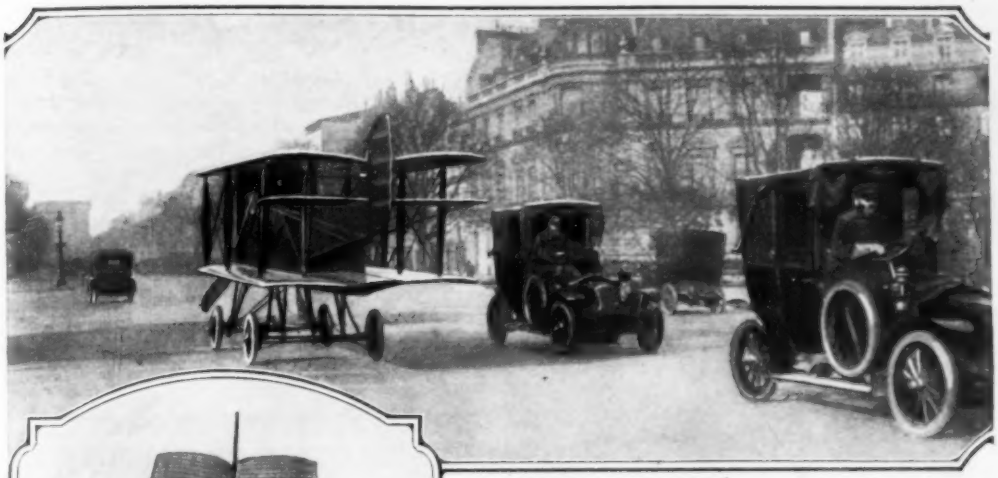
## DOLLS AND ANIMAL TOYS MADE FROM OLD INNER TUBES

One day a New Orleans business man was looking at a pile of worn-out inner tubes, but he was thinking of his baby and an idea occurred to him. With a pair of scissors, a bottle of rubber cement, and a pen and ink, he soon converted the old tubes into dolls and animals. The baby thought they were the finest toys he had even seen, and all the neighbors' babies agreed with him. Before long a small factory had to be built to supply the demand for the rubber toys, and the designs were copyrighted.

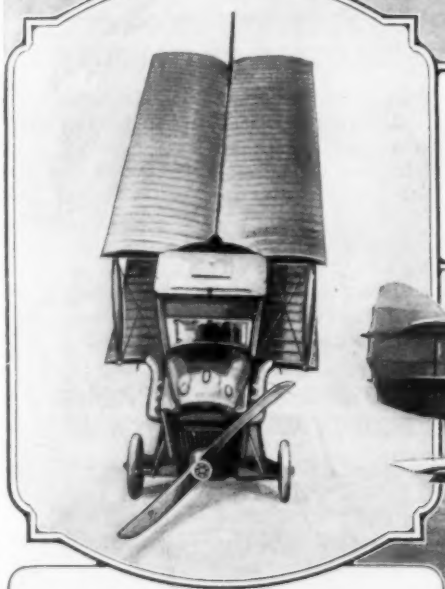
Some of the Toys, Made from Old Inner Tubes, Which are Becoming Popular for Babies

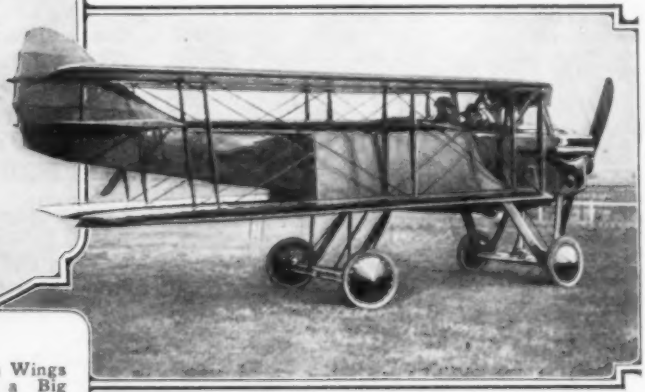
## "FLYING AUTOMOBILE" IS FOLDING-WING BIPLANE

At the annual Aero Show, in Paris, France, a new airplane was exhibited which has been popularly termed the "flying automobile." It is a biplane with folding wings and an auxiliary motor. The wings are hinged to the fuselage and fold back, along each side of it, in much the same way as the wings of some of the American folding planes. With the wings folded, the machine is about the size of a large motor truck, and requires a hangar no larger than a garage. It can be run in the streets under its own power, using the 10-hp. auxiliary motor. For flying, a 300-hp. motor furnishes the power. A demonstration of its practicability was given at Buc, France, and it proved to be entirely successful in both the flying and land tests. It attracted much attention when run through the Paris boulevards.



The New Campier Biplane, the French "Flying Automobile," on the Avenue des Champs Elysées, in Paris: This Photograph Shows How the Machine, with the Wings Folded, Compares in Size with Ordinary Automobiles. Below: A Side View, Showing How the Wings Fold Back along the Fuselage





PHOTO, UNDERWOOD & UNDERWOOD

From Above, the Airplane, with Its Wings Folded, Looks Very Much like a Big Motor Truck or Bus, and It Requires About the Same Storage Space. When It is Run on the Ground, the Power is Furnished by a Small Auxiliary Motor

With the Extra Wheels Removed and the Wings in Normal Position, the Machine Is an Ordinary Biplane, with Nothing to Distinguish It from Other Planes of the Same Type

PHOTOS COPYRIGHT, M. ROL

## LEAD DIAPHRAGM IS USED WITH X-RAY APPARATUS

Although it is not generally known, the accurate photographing of stout persons with X-ray apparatus has heretofore been

This Concave Lead Diaphragm Eliminates the Secondary Rays When a Stout Person is Photographed by X-Rays

a somewhat difficult task. The reason for this difficulty is the presence of secondary rays which make the plate "cloudy" and which are caused by the thickness of the patient's body. A new diaphragm composed of lead grids is now available, the use of which entirely eliminates these annoying rays. Thus the picture of the fleshy individual can be made as clear and well defined as that of the most frail subject.

## SEEDLESS GRAPES IN EASTERN AND NORTHERN STATES

Considerable work has been done by the director of the New York Botanical Garden, in coöperation with the State Experiment Station at Geneva, in connection with the development of seedless grapes for the northern and eastern states. Plantations have been made in the Botanical Garden, and some have already borne fruit. Cuttings of others have been supplied by the State Experiment Station, and from the Experiment Station of California, cuttings of all the most important of the Vinifera grapes have been obtained and are now growing in a nursery. Later these are to be planted in a vineyard, containing specimens of wild grapes, the principal cultivated varieties hardy to that section, and several varieties of the Vinifera, which can be grown there successfully by providing protection in winter. Critical studies will then be made of these plantings.

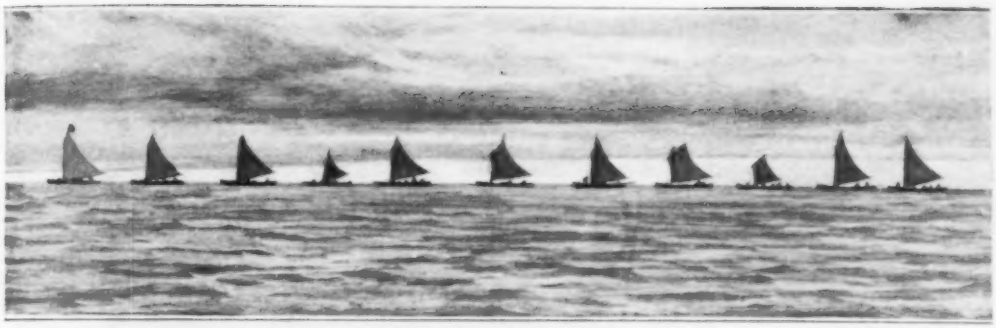
## BILGE STATIONS TO PREVENT POLLUTION OF HARBORS

It has been proposed, in Baltimore, to establish two bilge stations in Chesapeake Bay, one to be utilized by incoming, and the other by outgoing ships, with the object of preventing the pollution of the bay from oil in bilge water. It is claimed that bilge water is now killing fish, oysters, and wild fowl by the thousands. Similar stations are operated successfully in New York. It is estimated that each station would cost about 50,000 dollars.

## TIRE PUMP AS AN ACCESSORY FOR LOW-PRICED CARS

As a standard equipment of an automobile a power-driven tire pump has long been in use on many makes of higher-priced cars. There has now been developed a power-driven tire pump that is available as an accessory for low-priced cars. It is a combination of tire pump and radiator fan, replacing the standard fan and bracket assembly. A simple clutch throws the tire pump into or out of operation. The pump is of the piston type, and it is driven by a disk crank connected with its fan pulley.

¶A New York City cigar store has a series of humidor compartments built into one wall. When a customer buys a box of cigars, he is given the only key to one of these compartments, and may keep his cigars in it as long as they last.



The Alaskan Whalers Sailing for Home with the Captured Mammal in Tow: This Remarkable Picture was Taken at Night in the Light of the Midnight Sun

# WHALE HUNTING ON THE TOP OF THE WORLD

By LAWRENCE WILLIAM PEDROSE

ON the shore of the Arctic Ocean at the extreme northern point of Alaska lives a tribe of Eskimos who are declared to be the greatest whale hunters in the world. These hardy natives brave the dangers of the Arctic seas in open boats, skirting treacherous ice floes, facing deadly blizzards in search of game, which they often pursue scores of miles from land.

Whales are hunted in the Arctic in May and June, when the ice fields have broken up and swept southward into Bering Sea, and again in September, before winter seals the ocean with its impenetrable cap of ice. The mammals enter the extreme northern waters when the ice goes out in the spring, and stay until the ice returns. But the Eskimo pursues the whale when it appears early in the season, then turns his attention to seal and duck hunting, returning to the hunt for the mammals in the fall to fill his larder for the long winter.

The Eskimos of the Arctic have strange customs. It has proved difficult to convert them to the ways of the white man. Of the practical arts of the latter, the

The Whale Hunters Making a Temporary Camp upon the Ice: These Camps Are Necessary, as the Hunters must Be near the Open Water

A Typical Shelter Used by the Whale Hunters on the Ice Floes: Spear Shafts, Boats, or Sleds Form the Frame, over Which is Stretched a Sail, While Fur Robes are Used for the Floor Covering

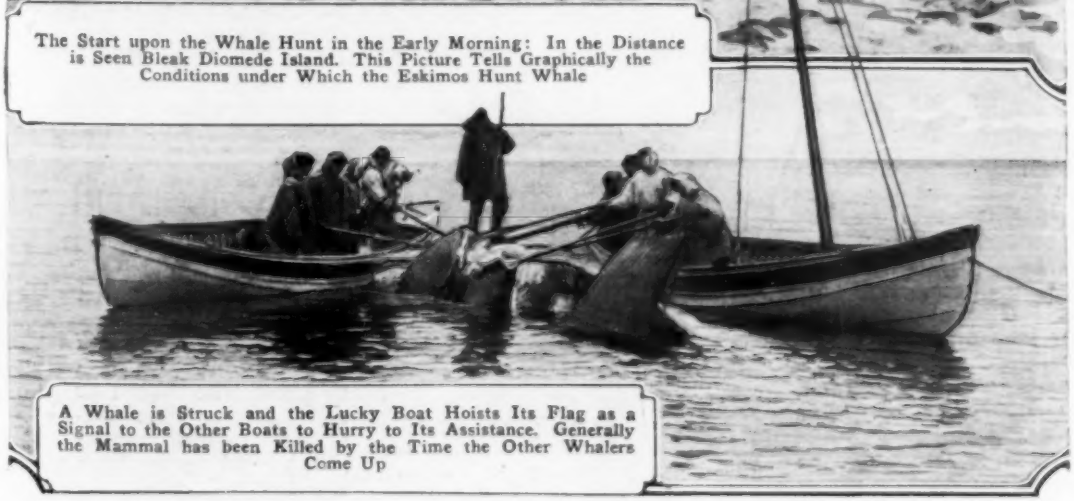
Anga-Took-Sanga, a Famous Arctic Hunter: This Native Has Steel Spikes in His Crutches. He is Said to Be a Very Swift Runner

Blanket Tossing, Which Is a Popular Sport with the Eskimos and Is Practiced during the Na-lu-ka-tak, or Celebration Following a Successful Whale Hunt: Young Women Are the Best Jumpers, Often Going 30 to 35 Feet into the Air

Dragging the Great Slabs of Whale Meat Ashore: All the Men and Some of the Women and Children of the Tribe are Required to Lend a Hand. Salvaging of the Meat is Followed by a Great Feast, Dance, and Distribution of the Prize

Tak-Pak, Champion Whale Hunter of the Arctic: Last Fall Tak-Pak Killed Seven Huge Whales between the Alaskan and Siberian Coasts

The Start upon the Whale Hunt in the Early Morning: In the Distance is Seen Bleak Diomede Island. This Picture Tells Graphically the Conditions under Which the Eskimos Hunt Whale



A Whale is Struck and the Lucky Boat Hoists Its Flag as a Signal to the Other Boats to Hurry to Its Assistance. Generally the Mammal has been Killed by the Time the Other Whalers Come Up

natives have adopted whale boats and firearms. The methods of hunting are their own.

When the whaling season begins, the Eskimos make temporary camps on the ice fields off shore, so as to be as near as possible to the open water. These temporary camps consist of improvised shelters made from upturned boats or frames of sleds, over which skins or paulins are stretched. Fur robes form the floors of the shelters.

Whale hunting to the Eskimo is the most fascinating sport. It is much in the nature of a regatta, with honors going to the boat which kills the first whale of the season. Despite its romance and glamour for the native, however, the hunt has a serious purpose; a successful season assures a winter's supply of food for the entire village.

With sails hoisted to the wind, the boats to the number of 10 or 12, each carrying three or four hunters armed with rifles, depart out upon the Arctic Ocean. They spread out over a vast area fully 50 miles square. Each boat carries a flag, and when a whale is struck, the signal is hoisted, whereupon all the other boats hasten to the assistance of the fortunate hunters. Usually the whale has been killed by the time the other boats come up.

A few of the Eskimo hunters have whaling guns, which shoot an explosive harpoon that instantly kills. Others have only their rifles or spears, with markers and buoys consisting of seal skins inflated with air.

Weather conditions increase the hazards of hunting upon the ice-strewn Arctic sea. A storm may arise suddenly and blow the hunters far from home. When these storms occur in the Arctic, they usually last for days. The hunters, carrying only bare necessities, suffer greatly. Blizzards are to them as deadly as fogs in temperate waters are to fishermen there. The Eskimo has an unerring sense of direction, but this avails him little when the wind, lashing the grinding ice floes, cuts off retreat toward home. He must fight it out on the open sea and wait for the storm to subside.

When a whale is captured, the boats of the hunters assemble at the scene as quickly as they can. The boats are lined out, with sails up, each towing the other, the dead whale bringing up the rear, and the slow voyage homeward is begun. When shore is reached, the whale must be cut up in the water, since there are not enough men to drag the great carcass up on shore.

When the whaling season is over, each successful hunter gives a *na-lu-ka-tak* (celebration), with the rest of the villagers as his guests. There is feasting, blanket tossing, and a dance at the end of the program, which often lasts for days. All the old men and women, and the sick Eskimos, are guests of the prince of the whale hunt. Those not able to walk are carried by the men or hauled on sleds to that part of the village selected for the feast.

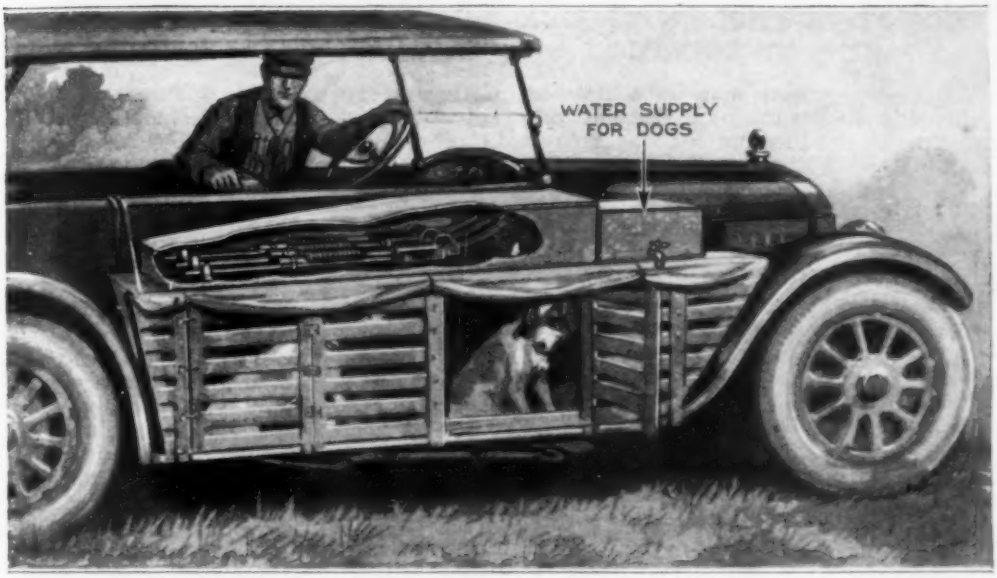
A feature of the *na-lu-ka-tak* is blanket tossing. Girls and young women are the best blanket jumpers. Thirty to thirty-five feet is a common jump. Some of the men are also good at this popular sport, but because of their suppleness, women always carry away the honors.

## FOREST RANGERS' FIRE ENGINE CAN BE CARRIED ON BACK

Fire engines, light enough for one man to carry on his back, are being manufactured for the use of forest rangers. The complete outfit, including the tank filled with gasoline, weighs only 74 lb. and will deliver 20 gal. of water a minute through a 1,500-ft. hose. The single-cylinder gasoline engine is said to be the smallest and lightest fire engine built. It will throw a stream ranging from 7 gal. a minute, with 160-lb. pressure, to 21 gal. a minute, with 90-lb. pressure. A two-cylinder outfit is also being made, which weighs 125 lb. Its stream ranges from 20 gal. at 115-lb. pressure to 40 gal. at 85-lb. pressure.

New Light-Weight Fire Engine for Forest Rangers, Showing How It is Carried

¶Write our Bureau of Information if you wish to know who makes or sells any article described in this magazine. Send no postage; the service is free.



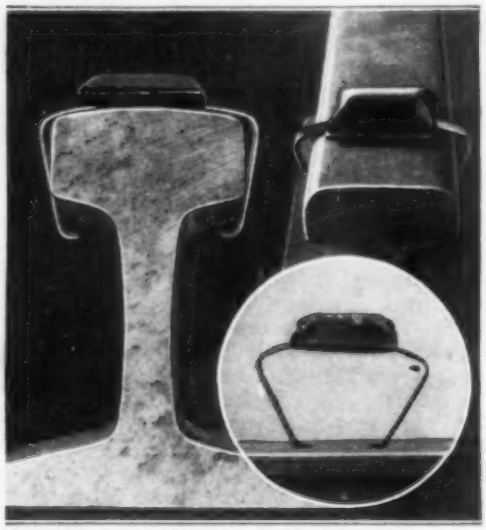

A Hunter's Automobile Fitted for a Long Trip: On the Running Board Is a Cage Large Enough to Hold Two Dogs in Separate Kennels. Above the Cage Are a Gun Case, Holding Three Guns, and a Water Tank

## HUNTING DOGS RIDE IN CAGE ON AUTO RUNNING BOARD

To save the strength of hunting dogs for work in the field, they are carried, where the distances are long, in comfortable cages placed on the running boards of the automobiles which carry the sportsmen. The cage is 69 in. long at the bottom, 25 in. high, and 12 in. wide inside. A partition in the center divides the carrier into two kennels. The cage is made of light lumber and lath, and has a canvas curtain on the weather side which can be let down to protect the dogs from wind and rain. Two metal bars, bent to fit the running board, are clamped beneath to hold the cage. A rack or box carrying three guns is placed above the kennel. And, of interest to those shooting in Dakota, for instance, where water supplies are sometimes far apart, there is provided a metal water box, which also rests on the kennel. This box is fitted with a stopcock at the lower part, making it easy to draw off water without opening the box.

## TRACK TORPEDO THAT APPEALS TO SIGHT, SMELL, AND HEARING

A new track torpedo, or fog signal, has been adopted by the Canadian Pacific Railway, that instead of appealing only to the sense of hearing, like the conventional signal, appeals to three senses—hearing, seeing, and smelling. When used by trainmen to protect trains from the rear, the torpedo is attached to the rail head, in the usual way, with a spring clip.

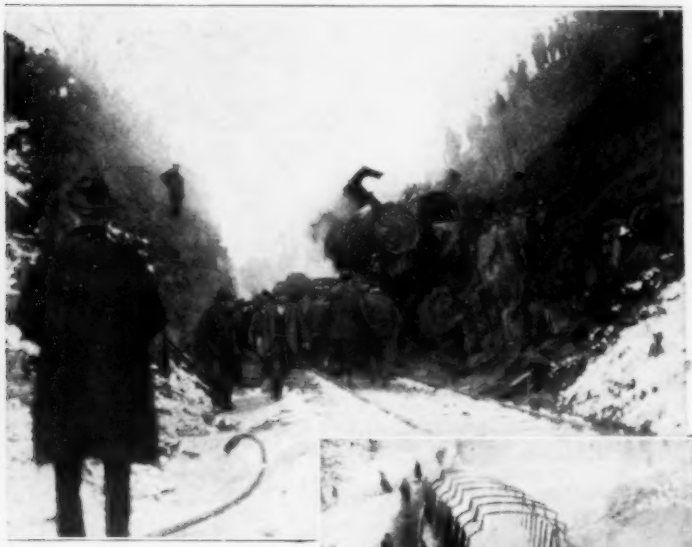


Track Torpedo, or Fog Signal, That, When Detonated, besides Making a Loud Report, Like Other Torpedoes, Gives Out a Brilliant Flash, and Emits a Pungent Odor

When fired, it not only makes a loud report, but also gives out a brilliant flash, and emits a pungent odor. It is made waterproof, and resists any atmospheric conditions of heat, cold, or moisture. This is essential in the Canadian climate with its great variations in temperature.

## LOCOMOTIVE THROWN UP SIDE OF HILL BY COLLISION

When two trains met in a head-on collision, near Bryn Athyn, Pa., not long ago, one of the locomotives was thrown high up on the side of a hill bordering the track by the force of the impact. The accident occurred on a single-track line between Philadelphia and Newtown, over which two local trains were running in opposite directions. Through some error they met on a curve. Though both engines were smashed and the trains badly wrecked, the crash was not directly responsible for all the deaths and injuries. Almost immediately after the crash the coaches caught fire, and many of the 25 deaths and 20 injuries were the result of the fire.



After the Crash: One Locomotive was Thrown Up on the Side of the Hill by the Force of the Impact

Most of the Injuries to Passengers and Damage to Property were Caused by Fire, Which Enveloped the Train Almost Immediately after the Collision

## HARVARD-BOSTON EXPEDITION FINDS ETHIOPIAN RECORDS

Discoveries made by the Harvard-Boston Archæological Expedition headed by Prof. George A. Reisner, of Harvard University, have made it possible to write the history of the establishment and rise of the Ethiopian Empire. The expedition has returned from 10 years of exploration in Egypt. The principal discoveries, relating to this formerly unknown portion of history, were made at Napata, the ancient capital of Ethiopia, now called Gebel Barkal, at the foot of the Fourth Cataract of the Nile River. At this point a group of pyramids were examined, and it was learned that the royal family of Ethiopia sprang from a tribe of Libyan nomads, who entered and became a part of Egypt, revolted, and later conquered the older country. Pieces of sculpture, paintings, and art objects, which were obtained, represent a remarkable civilization and the highest development of Egyptian art. The expedition was probably the most thorough, scientifically, that has ever been conducted.

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¶ Miniature pieces of furniture and many other everyday objects are used by Miss Mary LaVergne to teach simple French to beginning students, in the Minneapolis, Minn., South High School. Pupils use no textbook during the first term but, after this preparation go through the book as easily in the following two terms as other students do in three.

## GARAGE ZONING REGULATIONS TESTED BY APPLICATION

On the whole, the zoning regulations for garages, adopted by New York City in July, 1916, have proved highly satisfactory. Some defects have appeared, however, in the practical application of these regulations which should prove of interest to other communities now considering similar legislation. The principal defect is in the provision permitting the building of private garages, for not more than five motor vehicles, as accessories to residence buildings on the same lot, in residence districts. Such an accessory garage cannot be rented in whole, or in part, or used for business vehicles. It is felt that such rental and storage should be permitted as an incidental use, but that it would be abused if allowed. The proper solution is said to be the reduction of the number of cars permitted to three, and the allowing of one space for rental or storage of light business vehicles; which would require an amendment of the law.

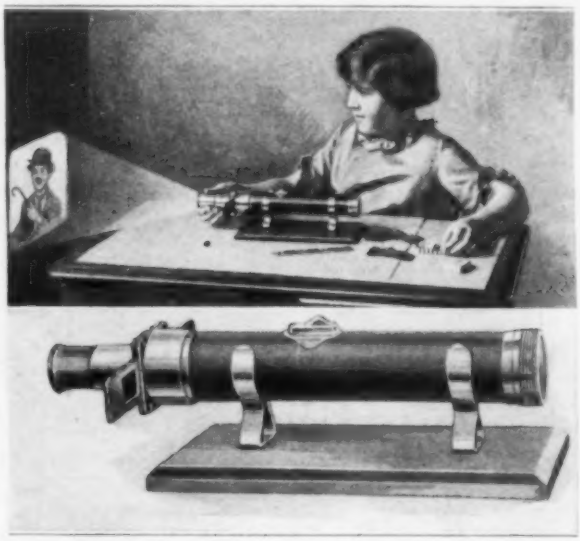
## MACHINE MAKES RAISED-LETTER COPY FOR BLIND TYPEWRITERS

Teaching many of the soldiers blinded during the late war to use typewriters as a means of earning their living, is a laudable effort of the German government. To prepare copy for the use of those so afflicted, a machine has been designed which stamps raised letters upon a tape. These letters are "read" by the blind typists, who use the highly trained sense of touch in their fingertips, and afterward write them on a regular typewriter.

This Machine is Used to Prepare Copy for Blind Typists by Stamping Raised Letters on a Tape

## HAND FLASHLIGHT ADAPTED AS MOVIE-FILM PROJECTOR

Single views, clipped from moving-picture films, can be projected on any white surface by means of an ordinary hand flashlight with a special lens and slide. The flashlight rests in nickelplated clips on a wooden base. A special reflector-and-lamp unit produces about 15 times the light of an ordinary flashlight and enlarges the 1-in. film view to a 9-ft. picture, with perfect detail. In the front end, which is telescoping, is mounted a metal slide carrier with three film apertures.



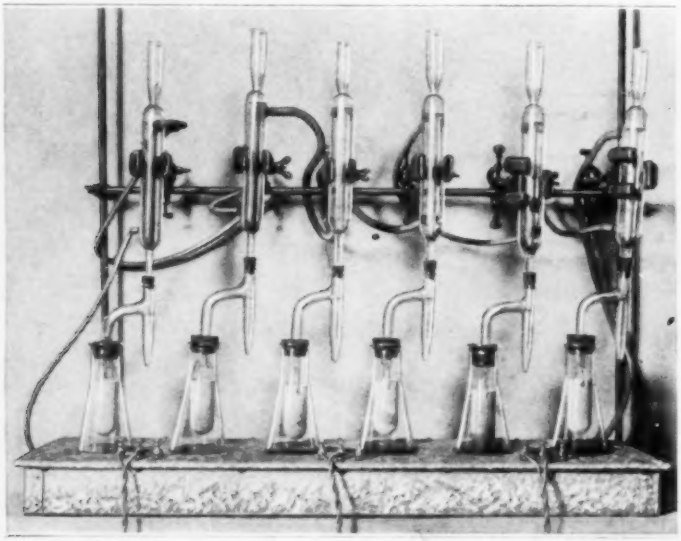
Above: The Projector, Placed on a Table, Throws Pictures on an Ordinary Wall. Below: Enlarged View, Showing Construction

## LARGEST ALL-AMERICAN-MADE TWIN-SCREW MOTORSHIP

The "Californian," the largest twin-screw motorship built and fully equipped exclusively in the United States, was recently launched at Chester, Pa., and it will be followed at an early date by a sister ship, the "Missourian." They are considered the most efficient type of motorship for long-distance voyages. Their dimensions are, 461-ft. over-all length, 59-ft. 8-in. beam, with a draft of 28 ft. at a deadweight tonnage of 11,000. The power equipment consists of two six-cylinder single-acting Diesel engines, each rated at 2,250 indicated horsepower at 115 r.p.m. The contract speed is 13¼ miles, and the normal fuel capacity is 1,400 tons, with a reserve capacity of 760 tons, giving a normal cruising range of 25,000 miles.

## DEVELOP EFFECTIVE PROCESS FOR RECLAIMING WASTE COAL

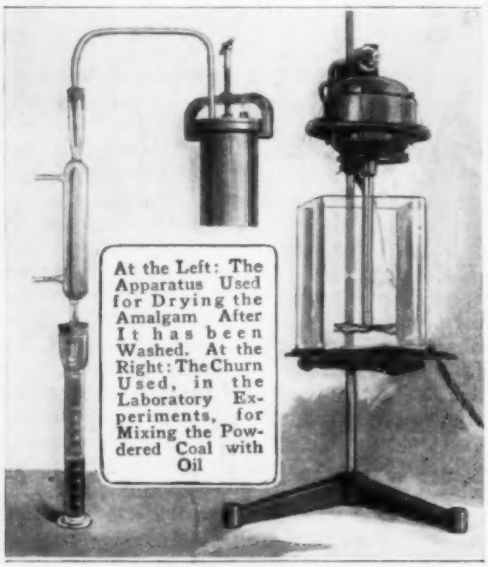
Laboratory studies by the United States Bureau of Mines indicate the possibility of reclaiming millions of tons of inferior coal, now going to waste at the mines, by a new method of refinement. The coal is pulverized sufficiently for free passage through a 200-mesh screen, finer pulverization not yielding a great enough reduction of ash to warrant the increased expense of finer grinding. It is then washed into a container and allowed to settle, after which it is transferred to a churn, with a paddle revolving at 1,000 r.p.m., where it is mixed with water. Oil is then added and the churning is continued. This action results in small egg-shaped granules, known as amalgam, which are the ultimate aim of the process, and are composed of purified coal, oil, and 10 to 30 per cent water. The entire mixture is next poured onto a 100-mesh screen and drenched with a fresh supply of water. It is then placed in the churn and washed until the amalgam is free of all mineral matter.



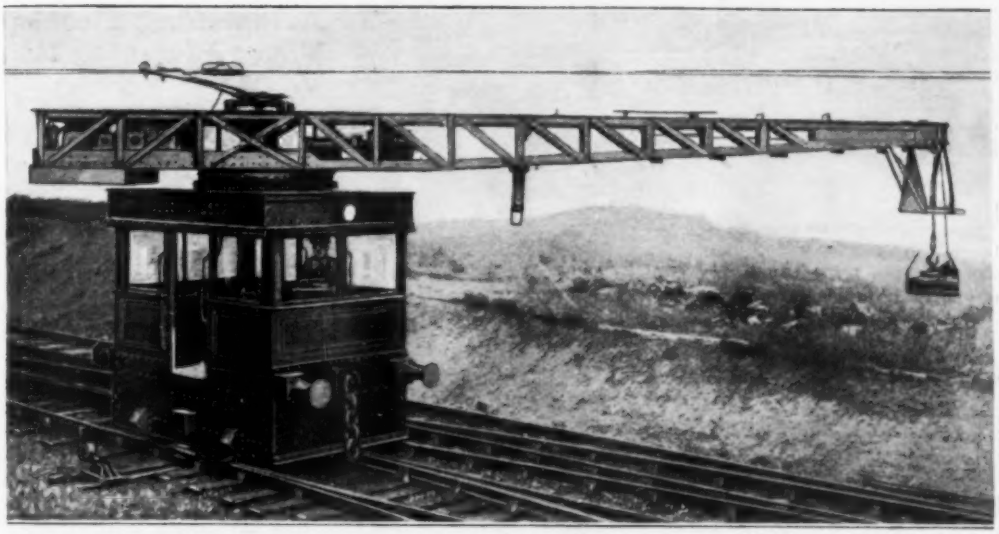
Laboratory Apparatus Used by the United States Bureau of Mines in Experiments to Develop a Practical Method of Reclaiming Waste Coal

It is claimed that this process is practically effective. Combustible matter is recovered to an extent exceeding 95 per cent. Mineral matter is eliminated to a satisfactory degree with either bituminous or anthracite coals, and the sulphur reduction is favorable with anthracite, though not with bituminous coals. Any oil having a high viscosity may be used, and oil wastage is negligible. For coal containing 25 per cent waste material, 450 lb. of light fuel oil to the ton of coal are required. Reaction takes place most readily with coal which easily absorbs oil but is not readily wetted by water, and with oil which does not easily form emulsions with water. Bituminous coals and graphite are more responsive to this treatment than lignites.

Amalgam Granules, Varying in Size Down to About One-Eighth Inch in Diameter, the Final Product Obtained in Reclaiming Coal



At the Left: The Apparatus Used for Drying the Amalgam After It has been Washed. At the Right: The Churn Used, in the Laboratory Experiments, for Mixing the Powdered Coal with Oil



Combination Electric Locomotive and Magnet Crane Which is Operated by One Man: At the Top is Seen the Trolley, and at the Right the Lifting Magnet is Shown at the Extreme End of the Crane

## MAGNET AND CRANE MOUNTED ON ELECTRIC LOCOMOTIVE

The combining of an electric locomotive with a magnet crane has produced beneficial results in England, as it can be handled by one man in the loading or unloading of iron. The crane has a 28-ft. radius, traveling in a complete circle in 30 seconds, while the lifting magnet is strong enough to sustain 10,000 lb. with its 2-in. steel plate. The locomotive possesses a speed of seven miles per hour, and has a framework of steel. The equipment is fitted with the usual standard motors, controllers, and trolley system.

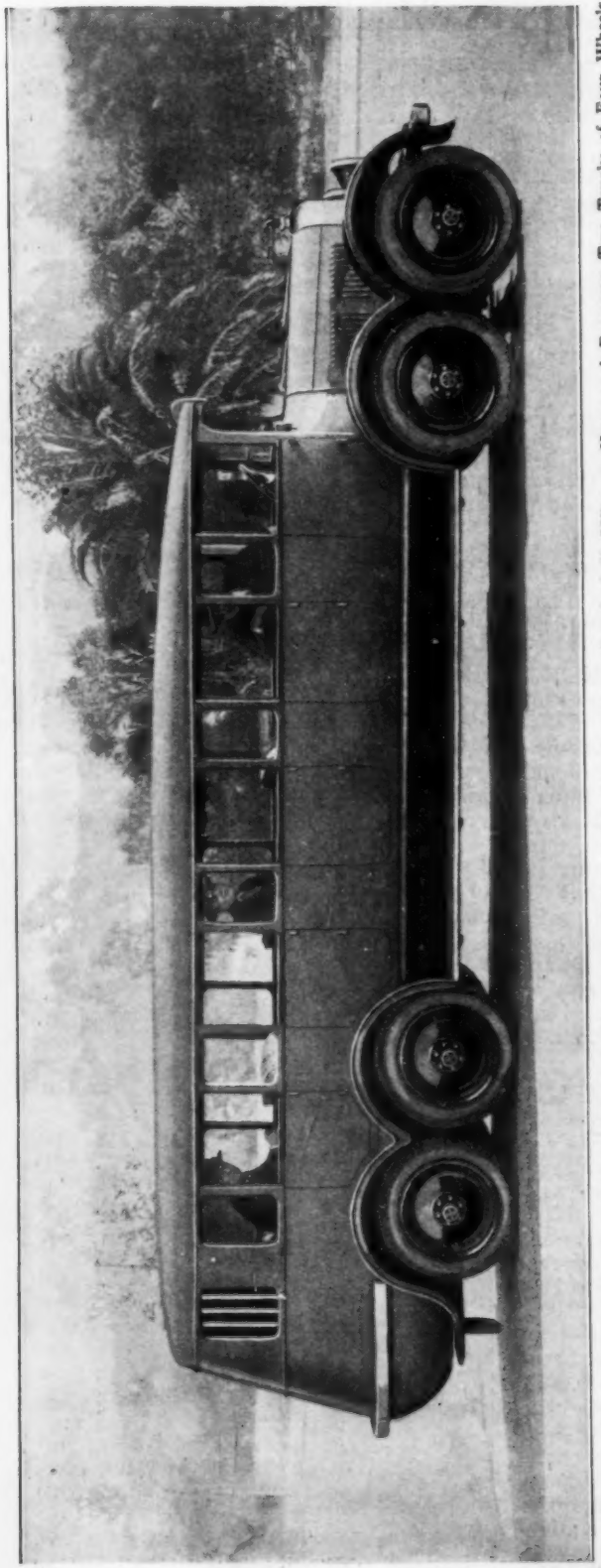
## ONE HUNDRED TONS OF RAILS MADE INTO SOUVENIRS

The fiftieth anniversary of the inauguration of railroad service in Japan was celebrated recently at Tokyo. About 3,000 persons took part in the ceremonies, which were held in a pavilion in front of the central station. More than 100 tons of steel rails were cut into 170,000 thin slices, bound with brass, and presented, as souvenir paper weights, to those attending the celebration. These rails were the first steel rails laid in the country, in 1871, on an 18-mile line between Tokyo and Yokohama. There are now 8,500 miles of railroad in Japan proper. The first locomotive, imperial coaches, and other pieces of early equipment were exhibited.

## GOLF-BAG HOLDER CLAMPS ON AUTO RUNNING BOARD

To the golf enthusiast who drives his own car, a new golf-bag holder for the machine should prove a great convenience. It is made of strong flat-steel stock, neatly finished in black enamel. Firmly clamped onto the running board of an automobile, it provides a safe and convenient place to carry golf bags.

This Golf-Bag Holder, Clamped to the Running Board, does Not Detract from the Appearance of the Car



An American Motor Bus of the Latest Type Which Seats 20 Persons, Weighs 8,000 Pounds, Has a Speed of 50 Miles an Hour, and Possesses Two Trucks of Four Wheels Each: The Eight Wheels Are a Distinctive Feature of This Car, and Due to Them Are Advantages Such as Double Axles at Either End, Elimination of Skidding, Easier Riding, and Added Traction

# MOTOR-BUS

## Astonishing Develop Prefer Busses to Rail

NOTEWORTHY departures from the usual manner of travel by tourists, have been evidenced by the constantly increasing demand for reservations on motor busses operating in various parts of the world. And equally remarkable have been the developments in the construction of these busses, until at the present time there have been incorporated into them sumptuous appointments which rival the best accommodations available on railroad trains or steamship lines. If present indications may be taken as a prophecy, the bulk of tourist migration in the future will be handled by this method of transportation.

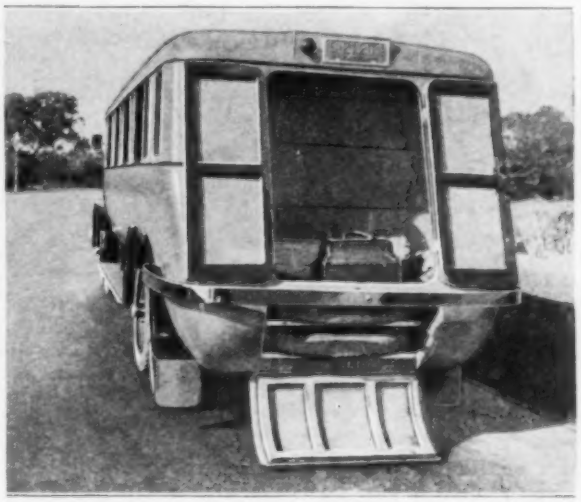
Ancient and medieval ruins, together with historic and romantic localities, will always be the Mecca of tourists, and pilgrimages to these places are being made more pleasurable each year by the facilities offered by the motor bus. While pleasure seekers annually migrate to all sections of this country, in advance of inclement weather, California is undoubtedly the greatest magnet for this class of people, and it is fitting that the latest development of the motor bus should emanate from there. The innovation consists of an eight-wheeled car, with a seating capacity of 20 persons, and a spacious compartment for the baggage of the passengers. For safeguarding the traveling public, the eight-wheel bus possesses many advantages over the four-wheel type. The new machine steers on all front wheels, which are fastened together by a special spring suspension, and constitute a truck, as likewise do the rear

# TRAVEL ATTAINS WORLD SCOPE

## ments in This Mode of Transportation — Tourists of the Future may roads — Motor-Car Touring will be Brought within the Reach of All

By H. A. LANE

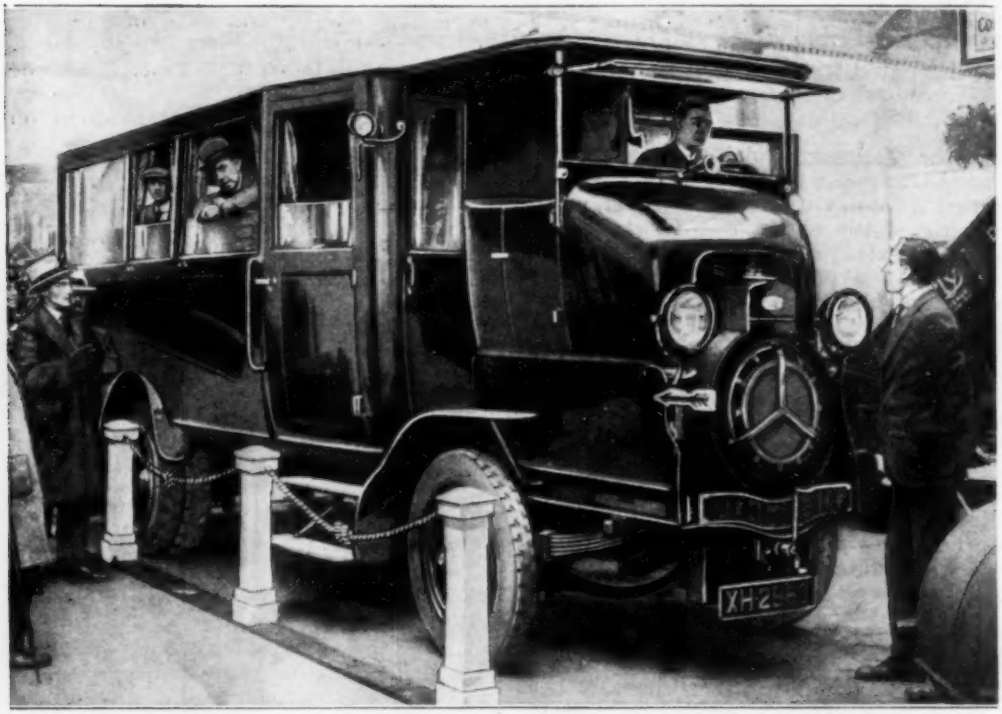
wheels. The car is driven by, and the brakes are applied to, the four rear wheels, so that its superiority is obvious. If, when running at top speed, one front or rear axle should break, the other axle would maintain the weight of the car. Likewise, if under the same conditions a front tire blows out, the machine can be steered on the three remaining tires, thus avoiding an accident. Although the bus weighs 8,000 lb., the pavement strain is considerably less than would be the case with a four-wheel car of the same weight, because of the eight bearing points, and because an air pressure of only 70 lb. is used in the tires, in comparison with the 90 lb. of the four-wheel type. Extensive tests made with this machine have satisfactorily proved that it will not skid, that it rides more smoothly and more comfortably than any four-wheel motor car, and that an average of 10 miles can be made on one gallon of gasoline. The eight-wheel bus has five cross seats for passengers, with a door for each seat, while the driver's seat has a door on each side. Although the interior of this new departure in motor-bus building is comfortably upholstered, there can be no comparison between it and some of the luxuriously arranged busses in Europe.



Rear End of the Eight-Wheeled Motor Bus, Showing the Compartment for Accommodating the Baggage of the Passengers and the Spare-Tire Compartment Just Below

European motor-bus travel has reached such enormous proportions as to warrant the construction of veritable "palaces on wheels." The most elaborate of these coaches are to be found on the French line operating between Calais and the Riviera. Nothing has been spared which might add to the comfort of the six-day trip between these points. The huge inclosed busses, with their highly polished maroon bodies, and fitted with large plate-glass windows, present a most imposing appearance. The seating capacity of this type of car is 20 persons, and provision is made for the travelers' baggage by the construction of lockers beneath the chassis, and by a guard rail on the top. Seats which hold two persons each, are placed, three on a side, at the forward end of the bus, and face forward also, leaving an aisle down the center to the seats in the rear. A U-shaped seating arrangement, extending around the bus in the rear, gives space for eight persons. The seats are beautifully upholstered in a serviceable French gray rep, with the back and seat cushions deep

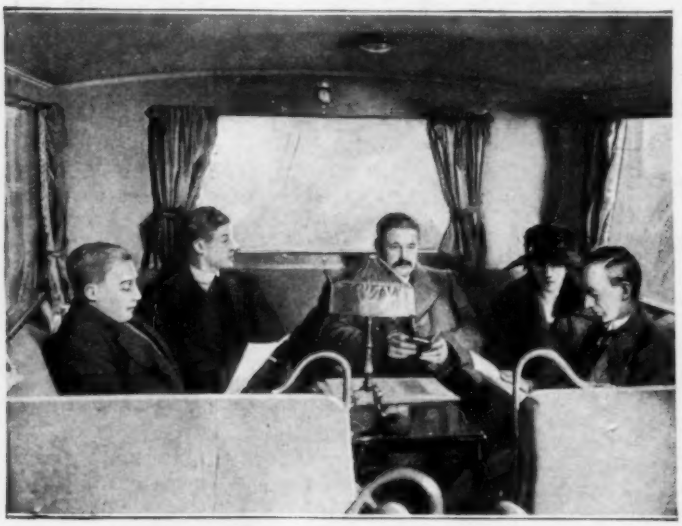
Front Truck of the Eight-Wheeled Motor Bus, with One Wheel Resting upon a Curb, Graphically Illustrating the Remarkable Flexibility of the Axle Arrangement



One of the Lavishly Equipped French Motor Busses Now Operating between Calais and the Riviera, Which Have a Seating Capacity of 20 People: They are Fitted with Tire-Safety Apparatus and Arrow-Signaling Appliances; One of the Latter can be Seen under the Right Headlight

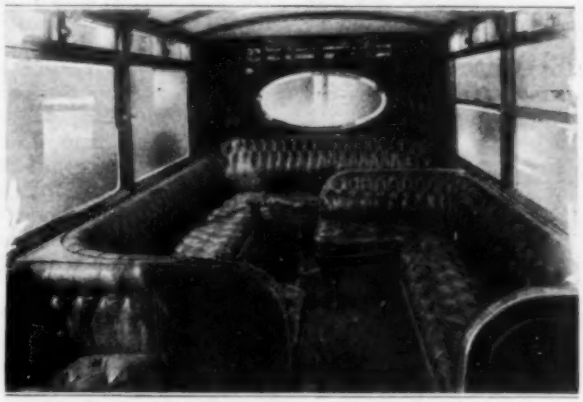
and well sprung. Nickelplated fittings are used throughout, including the grip handles on the transverse seats at the front end. Electric cigar lighters are installed, ash trays are fastened to the seats, and neat electric-light fixtures are mounted in the ceiling, which is finished with the same cloth as the seats.

There are four windows which can be raised or lowered at will, on each side of the bus, and one large square observation window, which is immovable, is placed in the rear of the body. A bevel-edged full-length mirror is located just behind the driver's compartment, and at the end of the center aisle. The vehicle is fitted with day and night safety signals and tire-safety valves. The safety signals consist of two arrow indicators, one at the front and one at the rear, and are operated from a control box near the driver. At night, the arrows are illuminated, the front one showing green, and the rear one being red. An electric horn sounds automatically with the operation of the signals, so that other motorists have their attention drawn to the intended change of direc-



Interior of the Calais-Riviera Motor Bus, Showing the Seating Arrangement: On the Table and the Ceiling can be Seen the Electric Fixtures. The Windows Shown Are All of the Finest Plate Glass

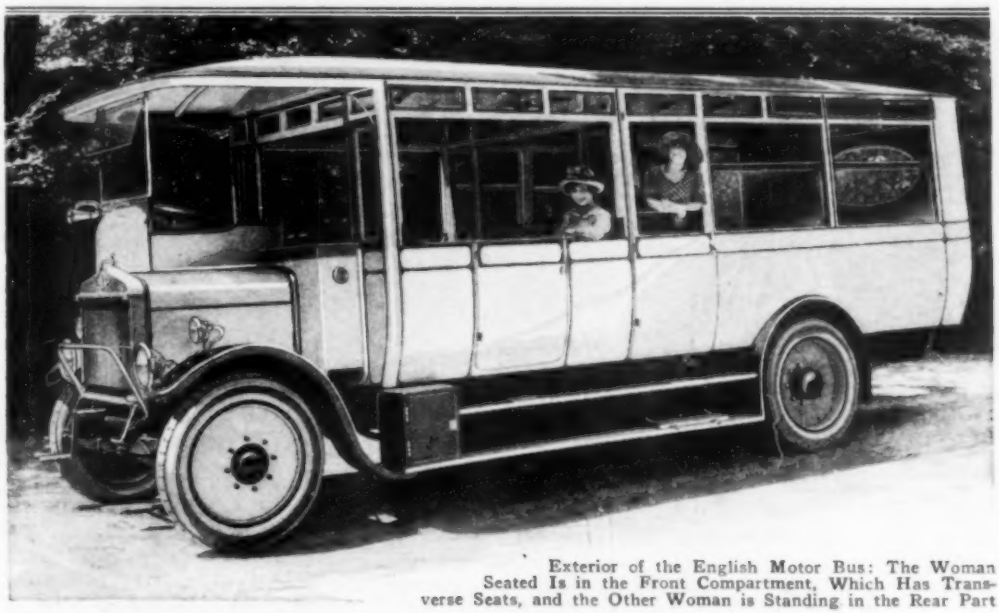
tion. The tire-safety valves project from the rim of each wheel, and when the pressure of air in the tire falls below a certain amount, a spring attachment is released, which explodes a cartridge, thus informing the driver of the condition.



Interior of an English Motor Bus Which Has Two Separate Compartments with a Seating Capacity of 26 Persons: The Rear Compartment Only is Shown Here

Somewhat similar to the French busses are those to be seen in England, which are designed to accommodate 26 passengers. The English vehicle is divided into two distinct compartments, one immediately behind the driver's seat and one at the rear. In the front compartment are two transverse seats extending the width of the body, and having a capacity of 10 persons. The rear compartment has seats running around the sides of the car which comfortably accommodate 16 persons. Each section of the bus has a separate entrance. The interiors are elaborately fitted, and have polished-walnut finish, except the ceilings, which are of white-enameled linoleum. Electric lighting is provided throughout, as in the French machines, and the upholstery is of real antique leather.

Plate-glass windows, which can be raised or lowered, surround the rear compartment except at the back, where a large oval observation window is placed. A locker extends along the entire left side of the bus for the carrying of baggage. Another type of English motor bus has a capacity of 18 passengers, and all the seats are of the revolving-armchair kind, except four that are built into the back of the body. The swivel seats are arranged in three rows facing forward. If the bus should be engaged by a small party, the four seats in the center row can be removed, and a long table brought into use. The table folds neatly against the underside of the top when not in use, and is held there by spring brackets, entirely out of the way of the passengers. It is a simple matter to lower the table into position, and as the seats revolve, it is possible to turn them toward the table,

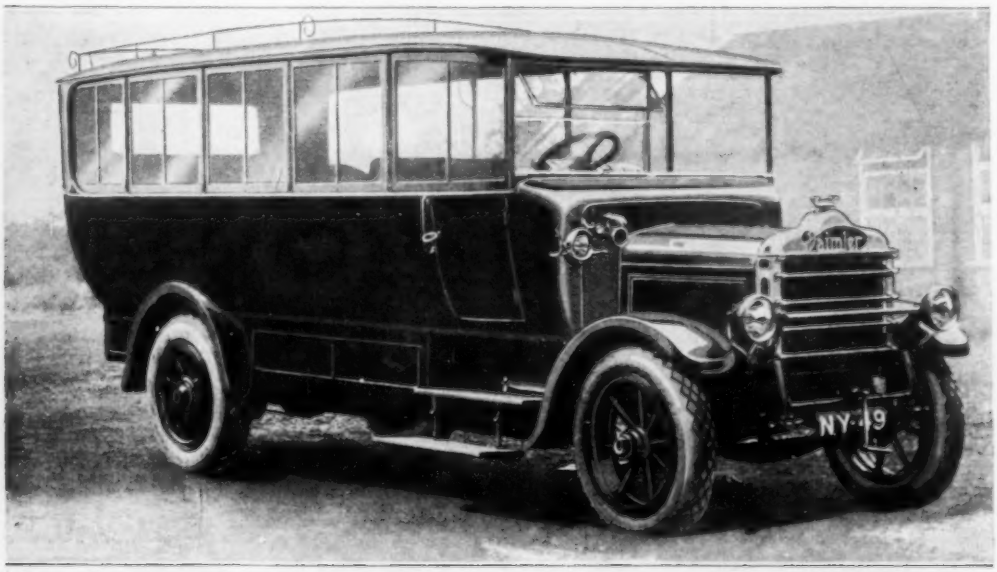


Exterior of the English Motor Bus: The Woman Seated Is in the Front Compartment, Which Has Transverse Seats, and the Other Woman is Standing in the Rear Part

so that the tourists can enjoy one another's company in the participation of refreshments, or in various kinds of games. As in the French motor busses, nothing has been overlooked in the way of conveniences for the passenger, as far as it was in the power of the bus builders to install them. The same holds true of the many busses now operating in Scotland, Norway, Switzerland, the French Alps, the Pyrenees, and other points at which tourists gather in Europe. When a traveler makes a reservation on one of these modern motor busses, he is assured of all the comforts of a private limousine, while enjoying a wonderful sight-seeing trip.

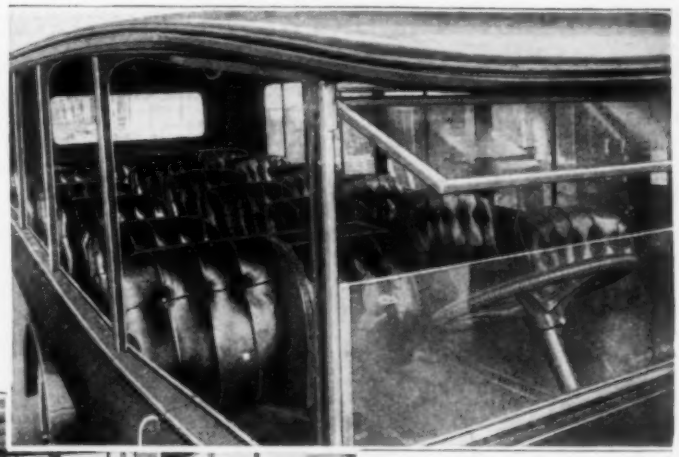
While pleasure seekers undoubtedly dominate motor-bus travel in Europe, this mode of transportation is being applied in practical usage in the United States. Numerous sections of this country have found these cars to be an essential means of overland travel. Especially is this true in Minnesota, where between 70 and 80 bus lines are operated to connect the peculiar fan-shaped system of railroad lines, which run out of St. Paul and Minneapolis to all corners of the state. Thus, a traveler desiring to go from a point on one line to a point on another, can take a cross-country trip by motor bus, instead of riding back to the Twin Cities and then out on another line. Even along the railroad right of way, the busses can successfully compete with the steam roads, because of the possibility of stopping at every farmhouse on the route, if necessary. Each of these farmhouses is designated as a "station" on the bus-line schedule, consequently the farmer is assured of transportation to his very doorstep. The Minnesota busses have regular passenger terminals, time tables, tickets, and advertising literature similar to that used by the railroads, and this is prominently displayed in hotels and other public places along the route. These motor busses are not as lavishly equipped as the European bus, as they are not considered pleasure conveyances, but this country may see the entry of the elaborately furnished motor bus into the coast-to-coast touring field, if certain rumors of an intended bus line to extend from New York to California, prove to be founded on fact. Regardless of the rumored Atlantic-to-the-Pacific line, the initial trip of Lakes-to-the-Gulf expeditions has recently been completed. This premier of bus-touring parties to southern climes was organized in Chicago and departed from there not long ago.

The owner of a fleet of the familiar sight-seeing cars endeavored to find a profitable use for his property during the winter months. He advertised a proposed trip to New Orleans, with side excursions to the Mammoth Cave, Civil War battlefields, and other places of interest. The idea was eagerly accepted by prospective tourists, and in a few days all available seating space was reserved on his six machines. The cars were then fitted with inclosed tops similar to those used on the

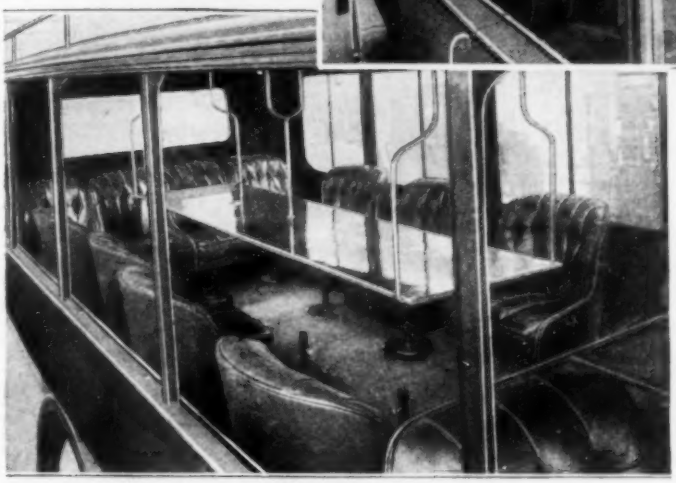



**Another Type of English Motor Bus, Having One Compartment Only, with a Seating Capacity of 18 Passengers: On the Running Boards, in Front of and behind the Rear Fender, Are Lockers for Baggage**

busses in the national parks, and the first Lakes-to-the-Gulf motor-bus party started on its pioneering trip. The picturesque Dixie Highway was chosen as the route of travel, and a wonderful 1,600-mile sight-seeing trip was enjoyed on the way to New Orleans. While in the South, the busses can be returned to their usual use as sight-seeing cars, and in the spring, the owner will doubtless find many tourists eager to make the trip back north.

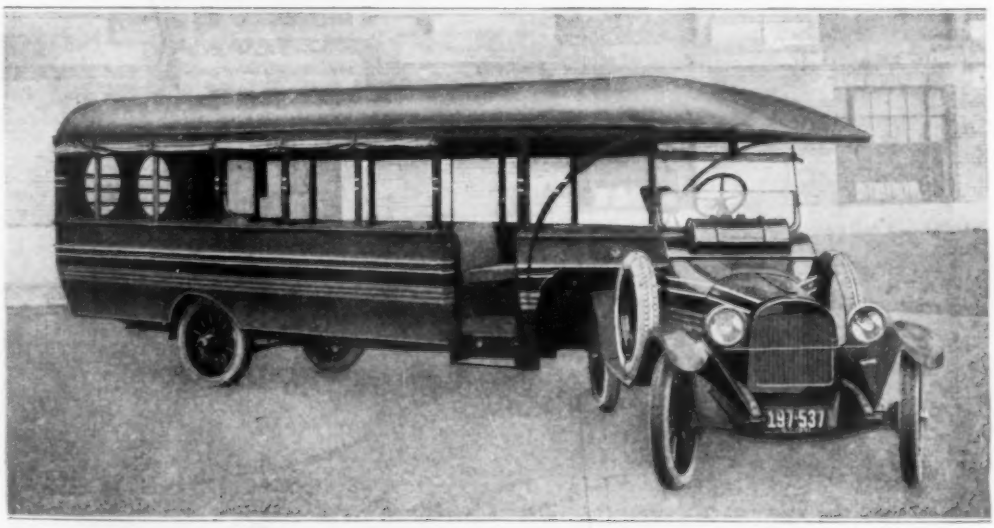


Interior of an English Motor Bus, Showing the Seats Arranged in Three Rows: With Small Parties the Middle Row is Removed to Make Room for a Table



Same as Above, Except with Middle Row of Seats Removed and a Table Installed: When Not in Use, the Table Folds and is Fastened against the Ceiling of the Car

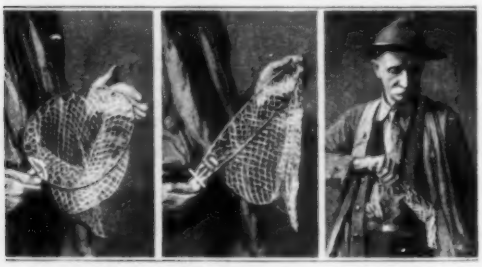
Thus it is apparent that motor-bus touring, the world over, is going to increase in popularity each year, and to the people will be offered ample opportunities of forming an intimate acquaintance with the many wonders and beauties of the earth.




An American Motor Bus of the Trailer Type: The Trailer will Accommodate 26 Passengers and is Attached to the Chassis of a Small Car. Although the Bus Appears Unwieldy, It can be Turned Around in a 50-Foot Space without Backing, and in an Ordinary Street by Backing Only Once

## NEW TROUT-LANDING NET CARRIED IN POCKET

No more need the fisherman lose his temper, and perhaps the fish, because his landing net becomes entangled at the

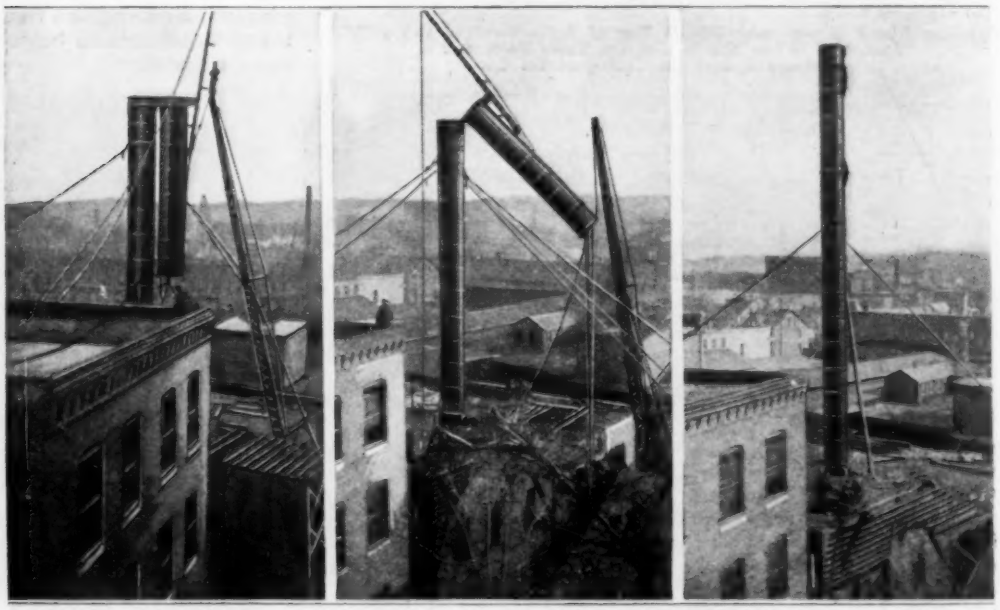


Left: Trout-Landing Net Sprung Open by Simple Pressure of Handle. Center: Net Closed by Releasing Spring Mechanism. Right: Folded Net Carried in Pocket

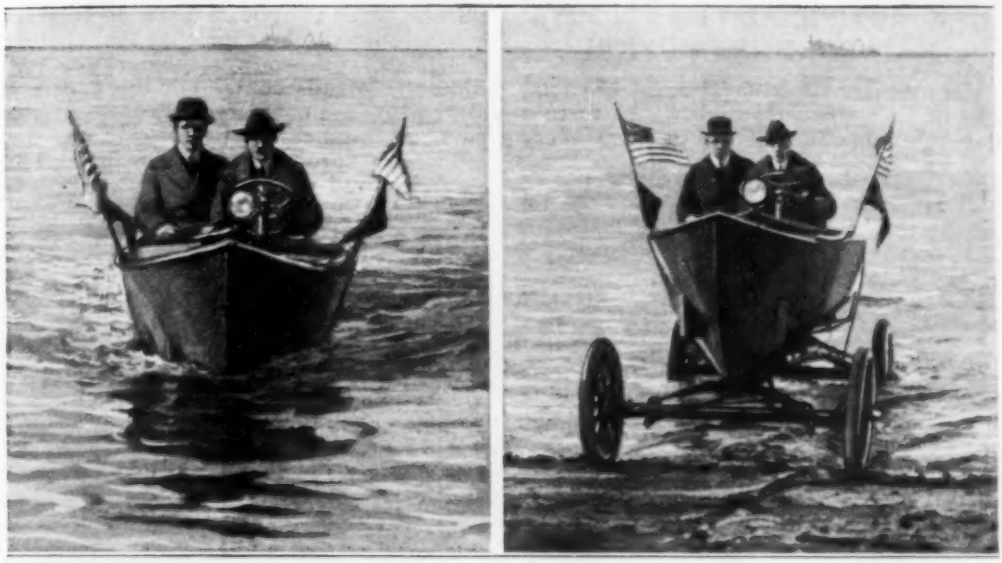
psychological moment. A lover of the sport has made a folding net with a spring-steel rim, which can be carried in the pocket until the fish has been hooked and played clear up to the angler. Then the net is grasped, and a simple pressure on the handle causes it to spring open in circular shape, ready for landing purposes. Should the lively trout thrash around too energetically after being landed, the release of the spring mechanism closes the net, making it impossible for the fish to get free.

## SMOKESTACK IN TWO SECTIONS ERECTED WITH A CRANE

An 80-ft. smokestack was to be erected on top of a building only 25 ft. high, in Dubuque, Ia., and therefore, with the exercise of a little ingenuity, it was found possible to do this with a crane standing beside the building. The stack was 54 in. in diameter, and weighed seven tons. To facilitate its erection in this manner, it was made in two pieces, the lower one 52 ft. long, and the upper one 28 ft., with a hinge provided for connecting them. A 15-ton crane, with a 70-ft. boom, was used, first to lift from its position an old stack which was to be replaced by the new one. The first section of the new stack was then raised by the crane, and when in position, the second section was raised, and held so that a man on top of the boom could make the hinge connection. This left the upper section hanging parallel with the lower one. To the side of the upper section, opposite the hinge, an I-beam was lashed, with one end projecting so as to form a lever, which, when pulled downward with a line connected to a winch at the base of the stack, swung the upper section vertically. The two sections were then bolted securely together. The simplicity of the operation made it possible to finish the whole job in one day.



Erecting a Smokestack with a Crane: Left, the Man on Top of the Crane Boom has Connected the Two Sections at the Hinge between Them; Center, the Top Section is being Swung Upward by Means of a Rope from the Beam, Lashed to the Upper Half of the Stack, to a Winch at the Base, and Right, It has Reached the Vertical Position, and the Two Sections are Locked Together



PHOTOS BY GILLIAMS SERVICE
**In the Water, at the Left, This Machine Looks No Different from Any Motorboat, but When It Reaches the Shore, as at the Right, One Sees That It is Mounted on Wheels**

## NEW MOTORBOAT-AUTO LOOKS LIKE A BOAT ON WHEELS

Another combination automobile and motorboat has been built, by a New Jersey inventor. In general appearance, it is like a boat, mounted on springs, on four pneumatic-tired wheels. It was thoroughly tested at Bayonne, N. J., recently, and is said to have performed in a most satisfactory manner. It worked equally well on the land and in the water. By the state authorities, it is classified as a motor vehicle, and it carries a regular state automobile license.

## TURBINE LOCOMOTIVE FOR SWISS RAILWAYS

Up to the present there has been comparatively little effort made to apply the steam turbine to locomotives, and less here than in Europe. Among other attempts that have been made in Europe, a notable one is that of a turbine-driven locomotive now being tried on the Swiss federal railways. The turbine, by means of a reduction and reversing system of gears, drives a shaft mounted transversely above the forward truck, and having a crank at either end which drives the connecting rods of the six-coupled locomotive wheels. Trials of this locomotive have shown fuel economy greatly superior to that of compound locomotives, and it is claimed that the turbine will ultimately give the same superior efficiency on the locomotive as it does on stationary and marine engines.

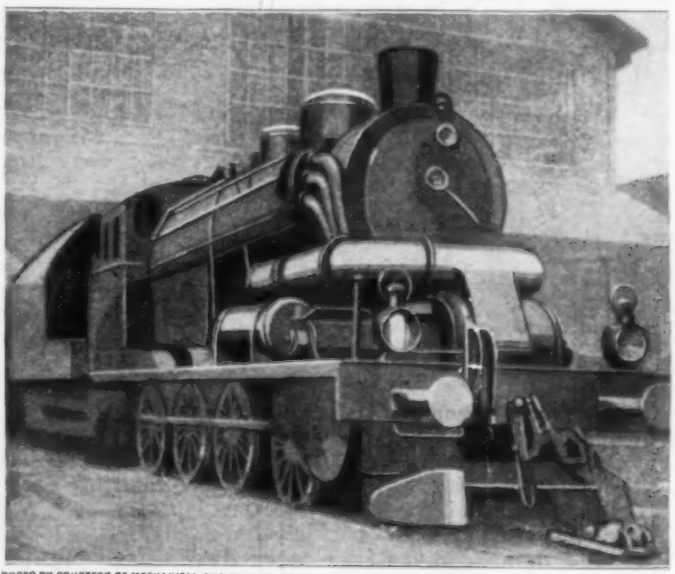
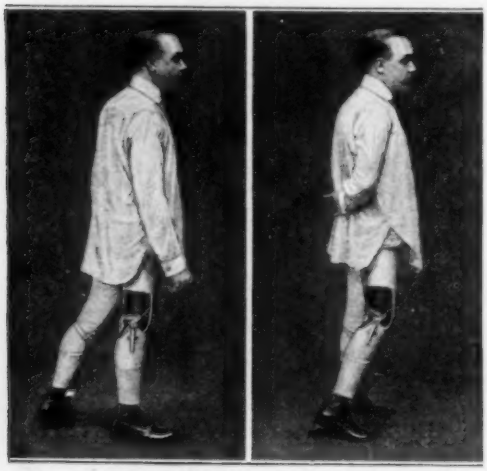


PHOTO BY COURTESY OF MECHANICAL ENGINEERING
**Standard Locomotive Changed from Reciprocating to Rotary Drive by Means of the Turbine Seen in Front of the Smokebox: This, through Reduction Gears, Drives a Transverse Shaft above the Forward Truck, Which Has Link Connections to the Coupled Wheels**

## NEW ARTIFICIAL LEG PERMITS NATURAL KNEE MOTION

An inventor of artificial limbs has long sought an appliance which would force a flexion, or bending of the knee, at every



Left: Weight of Body on Artificial Limb. Right: Weight on Other Limb Allows Elastic Band to Flex the Leg for the Next Step

step, thus producing a natural motion for the manufactured leg. In solving this problem, the maker of the new leg strove to imitate, as near as possible, the muscles of the human limb. By means of elastic bands and a suspender-cord arrangement, he has succeeded to an amazing degree. When the weight of the body is shifted from the artificial member, as in walking, the suspender cords raise the leg and cause it to bend at the knee. The next action of these cords, together with an elastic band, straightens the leg again, so that it is ready to support the body on the next step.

## MOUNTAIN IN PACIFIC OCEAN IS HUGE MASS OF SULPHUR

The recent rediscovery of the great sulphur mountain of Vanua Lava, an island situated some 900 miles due east from Australia, which consists almost entirely of sulphur, brings into prominence the possibilities of exploiting the natural fertilizer beds of the islands of Nauru and Ocean, in the southern Pacific Ocean. These islands are famous for their extensive and rich deposits of phosphate of lime, and this, together with sulphur, forms the necessary combination for producing a soluble, or powdered, superphosphate, which is sold to farmers for a fertilizer. Thus it appears that, as sulphur is the special agent needed to change phosphate rock to a soluble state, and since the islands containing the essential ingredients are comparatively close neighbors, as distances in the Pacific go, the economical production of fertilizer will be an assured possibility.

## AMATEUR RADIO MESSAGES CROSS ATLANTIC OCEAN

In a recent ten-day experiment, by the American Radio Relay League, 26 amateur wireless stations in the United States succeeded in sending test messages across the Atlantic Ocean. These messages were officially received by Paul Godley, the representative of the league in Glasgow, Scotland. A message was received at the league headquarters, from P. R. Coursey, editor of an English radio magazine, stating that some of the test messages had been picked up by a number of British amateur receiving stations.

## GASOLINE REMOVES ASPHALT FROM CONCRETE BY BURNING

Many a workman might have been saved much labor removing asphalt from joints between concrete slabs, or from concrete surfaces, with tools, if he had known it could be burned off by pouring gasoline on it and setting fire to it. Though this method requires caution, it is much quicker and cheaper than the old method, and does not damage the concrete if properly applied. A continuous fire, which might overheat and damage the concrete, should be avoided. It is better to make short, repeated applications of the gasoline. Great care must be taken, in inclosed reservoirs, to provide plenty of ventilation and to avoid setting fire to wooden roofs.

One Man Removed a Half-Inch Coating of Asphalt from 15,000 Square Feet of Concrete Surface in Two Days, with Gasoline

## ISLAND WIRELESS STATION NORWAY'S WEATHER OUTPOST

On the little arctic island known as Jan Mayen Land, about 71° north latitude, there is a wireless station which serves as a weather outpost for the coast of Norway, 500 to 600 miles to the east and southeast. The island is only 34 miles long and 9 miles wide, its mean temperature is about 4° below freezing, and its weather is exceedingly stormy. Only once, until recently, and then only for a year, has anyone ever remained on it. Because it lies in the direct path of violent storms, which often strike the coast of Norway suddenly and with great damage to shipping, the idea occurred to Norwegian meteorologists to establish a radio station there. An appropriation of $10,000 was secured and the difficult task of establishing the station accomplished last summer. Since then regular reports, and warnings of storms, have been sent from the Jan Mayen. Once a violent storm blew down the masts and the reports were interrupted, but in a few weeks they had been replaced and the reports were resumed.

## TABLE AND BED ARE COMBINED IN "EFFICIENCY" FURNITURE

Every inch counts in the modern "efficiency apartments," and an aid in the saving of valuable space has appeared in the production of a new combined table and bed. In appearance, the table resembles the ordinary four-legged library type, but inside of the legs are a second set of legs which can be raised by means of a crank, thus elevating the top of the table. A peculiar advantage of this innovation lies in the fact that the table need not be cleared off before the top is elevated, as the mechanism simply causes the whole to rise. With the top raised out of the way, the exposed mattress is then unfolded.

Right: Combined Table and Bed Shown as Ordinary Library Table. Left: Elevating the Table Top Preparatory to Making Up the Bed

Below: Combined Table and Bed with Mattress Unfolded and Bed Made Up. The Articles on Top of the Table are Seen Undisturbed

## TOWER WILL COMMEMORATE FAMOUS IRISH DIVISION

Dedicated to the memory of the men of Ulster, who, as members of the famous 36th division, recruited in that province

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**Tower Dedicated to the 36th (Ulster) Division, on Thiepval Ridge, Where Some 5,000 of the Ulstermen were Killed or Wounded in One Day**

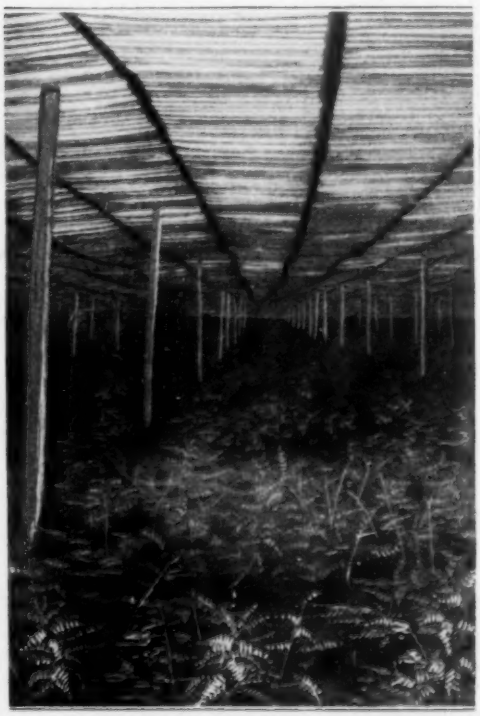
of Ireland, fell in the first Somme offensive, a stately tower, one of the most imposing monuments on the western front, was unveiled November 19, last year, by Field Marshal Sir Henry Wilson, Ulster's most illustrious soldier. The memorial tower is erected on Thiepval Ridge, where, as the division rushed to the capture of the successive objectives, some 5,000 of its men were left dead, dying, or wounded on the field that memorable day of the first battle of the Somme. It was announced that this site on the Thiepval slope will be preserved forever intact, with the German trenches, the barbed wire, and all the wreckage of battle.

## VAULT FLOORS ARE LOWERED AND RAISED BY MOTORS

In several great steel vaults, where safety-deposit boxes are kept, the use of electricity is employed in the preparations for opening the vault door. The vaults are so built with respect to the floors, that it is impossible to open the huge circular time-clock doors without the shifting of a floor section directly in front. A section in the shape of a half circle, and large enough to accommodate the arc of the swinging door, is lowered by means of electric motors. After the massive door is swung open, the motors are again operated to bring the floor back into place, and the same operation is repeated when the door is closed.

## GROWING FERNS IN FLORIDA FOR NORTHERN MARKETS

Just outside of Leesburg, Fla., are two large ferneries where many of the ferns sold in northern cities are grown. Since frosts are unknown here, ferns can be raised outdoors throughout the year. It is necessary, however, to protect them against the sun, and for this purpose overhead latticework is built, often covering three or four acres. Its cost is one of the chief expenses. When ferns are to be shipped they are packed in Spanish moss and sent by express to insure fresh delivery. The business is a profitable one, and brings thousands of dollars into the town every year.



**A Florida Fernery, in Which the Plants are Protected against the Sun by These Shelters, Built of Latticework and Covering Several Acres**

# COMMENT AND REVIEW

[These pages were printed December 27, 1921]

SOME 150 years ago a few shiploads of daring pioneers left the Island of Minorca and settled on the east coast of Florida in and around what is now New Smyrna. They cleared the jungle, dug many miles of huge drainage ditches, and planted the land to sugar cane. Several of their sugar mills for crushing the cane, made in Spain of an iron of wonderful endurance, still remain in a fair state of preservation and are today objects of wonder to winter tourists. The Minorcan colony, struggling against the forces of nature and hostile neighbors, worked with tools of very primitive character. In fact they had absolutely nothing corresponding to what we know as labor-saving devices. Soon hundreds of acres of most luxuriant growth of sugar cane swayed to the fanning of the trade winds. Just as a rich reward was almost in their hands, a series of terrible misfortunes came to pass through cruel enemies, and very few escaped to tell the tale. Nature, as though jealous at the intrusion, quickly restored the state of dense jungle, until there remained little trace of the once prosperous colony except the sugar mills and the great drainage ditches, which latter are today in a remarkable state of preservation and still doing useful service. During the past decade attempts, in a small way only, have been made to raise sugar cane in another part of the state.

*The Old Way*

TODAY, in startling contrast to the comparatively childish efforts of the Minorcans, vast sugar plantations, planned eventually to occupy hundreds of thousands of acres, are being laid out in the fertile stretches of the Florida Everglades, whose soil, harvesting for untold centuries a rich tropical growth, possesses a fertility which rivals the valleys of the Euphrates and Nile when at their best. Instead of ax and shovel, mammoth tractors, drawing every kind of modern labor-saving machinery, move in solid phalanxes, 150 of them, and at each setting of the sun 60 acres more have been cleared, plowed, harrowed, and made ready for the army of planters who follow. In one year or a little more, the hard roads and tramways will bring in long trains of wagons and cars loaded with sugar cane to the crushing mills, from which the sweet juice will flow night and day through a system of pipe lines to the refinery, work on which has already begun. Inasmuch as the sugar cane of the Everglades is said to rank, both in percentage of yield and quality, with the best Cuban cane, the industry may before many years produce a very large share of our sugar requirements, and at a minimum cost, as freedom from frost makes replanting necessary only once in five or six years.

*The Modern Way*

What a contrast between the heroic yet puny efforts of the Minorcans and the irresistible, highly organized, powerful mechanical forces of today, which know neither the pangs of hunger nor the fatigue of tired muscles; and what better illustrates the mechanical progress of recent years, and what the inventor has accomplished to lighten heavy human loads?

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While speaking of Florida it is interesting to note that indications of oil in at least one portion of the state are sufficient to warrant drilling, which has already commenced. Whether or not oil is found, Florida will one day be among the most prosperous of our states, with its ability to produce a great variety of grains, fruits, and winter vegetables; its rapidly increasing live-stock interests of pork and beef; its oysters and fish; its abundance of artesian water, and a climate, skies, and sea waters which fairly rival the Mediterranean.

IT cannot be other than a tremendous satisfaction to Marconi to have lived to witness the universal use of his discovery of how to hurl a message through air across oceans to ships and over continents to cities, thousands of miles apart. What hardly 20 years ago was almost a miracle, to be performed only by experts and scientists, has now become so easily done and understood, that some 60,000 amateurs, chiefly boys in their "teens," with antennæ raised from barn or ridgepole, daily and nightly pick up messages from points thousands of miles distant, or listen to lectures, concerts, and grand opera delivered far from their homes. While it yet seems a long way off, is it unlikely

*Progress in Wireless*

that before another 20 years shall have passed we may be provided with instruments which anyone can conveniently carry in his pocket, and so converse with home or office while walking from one to the other?

The electrical department of the city of Chicago has announced completion of plans for the installation of wireless telephones which will enable headquarters to communicate with police rifle squads, police and fire boxes, and police and fire-engine stations within a radius of 30 miles.

In telephoning over metallic circuits the important departure just now is the beginning of the end of the career of that efficient and much abused personage—the telephone girl. The start is already made, and as soon as the enormous task can be accomplished, telephone exchanges, even the largest, will require but a few attendants, and these mechanicians.

*Improved Mail Service*

THERE can be little argument over the fact that it takes longer to build up than to tear down, and that in the case of human agencies it is a very much more difficult job. Even in the most remote hamlet few have failed to realize to what depths of inefficiency our once so greatly admired national postal system had sunk: letters which once had seldom failed to pass from one part of a city to another part in three hours, at last took three working days, or more, to get through. When the previous postmaster-general finally relegated practically all second-class matter to the realm of coal and corn, and sent it like them by freight train, it seemed as if the last prop had been removed, and the morale of the whole army of postal employes went down at the same time. It has been no easy task to rebuild the once fine spirit of the men, especially after large numbers of the best had been forced to take up other occupations, and it is therefore a great source of satisfaction that already we can all see good results and a vastly improved service.

Among the many needed reforms, perhaps none is more directly felt and appreciated by the millions than the restoration of newspapers and magazines to carriage in mail cars on mail trains instead of box cars on freight trains. No longer the wait of two and three days until enough accumulated to make a carload. Now it goes out promptly, and keeps going, instead of being sidetracked and forgotten, sometimes for weeks. Where a year ago one copy in each 150 of this magazine sent to mail subscribers was reported to us as not received, last month only one in each 1,500 failed to reach destination, which includes copies carelessly wrapped or whose wrappers were unavoidably torn in transit. And what is really exasperating is, after having suffered several years with a most abominable service, that the present postmaster-general is actually able to rush the papers and magazines without increasing his force *and still save $268,000 a year* of what the freight system cost. The letter service has shown a corresponding improvement, possibly even more so, and grateful readers and publishers alike say, "Thank you, Will Hays, P. M. G."

*The Sales Tax*

THAT there is a steady, even though somewhat slow, reaction toward the sales-tax idea cannot be denied. Secretary of the Treasury Mellon has now expressed himself as favoring a general sales tax with a continuation of the personal income tax for the "rich." As no one, rich or poor, who has given the subject even moderate consideration, has asked or expected anything different, it ought to be worth the while of anyone whose income is over $6,000 a year to inform himself about the sales tax. If his income is less than $6,000 per year, it affects him only to the extent that where he is now "soaked" 23 per cent through indirect tax on what he buys, under a sales tax he would pay about 2½ per cent in the same indirect tax.

In some mysterious way the farmer and laboring man have been made to believe a sales tax would all come out of them, which, like Mark Twain's reported death as related by that beloved author, is "important if true."

A farmer puts the case like this: "A farmer sells a bushel of wheat and gets paid for a peck. The consumer pays for a bushel of wheat and gets a peck." Quite so, and the worst of it is, this condition is bound to continue with very little

abatement as long as the present system of taxation continues. Can anyone be surprised at sluggish sales and reluctant buyers when every retail purchase, from potatoes to penknives, imposes an average tax of 23 cents on the dollar? "When one week of unemployment costs the worker as much as he would pay for a 1-per-cent sales tax for a whole year, it is not difficult to say which he would prefer." And our present system of taxation is largely responsible for the blocking of the wheels of industry.

DO strikes really pay the strikers? How much would be your guess on what strikes cost in 1920? Our government, after carefully compiling the figures of wages lost in this country that year to men on strike, finds it to be $13,000,000 for every working day, after allowing six national holidays and 52 Sundays. The total for the year is the stupendous sum of $4,000,000,000, almost enough to run the government itself even in these times of expensive government.

*Cost of Strikes*

Four billion dollars lost in idleness, which might have been earned, spent on families and homes, and put in circulation!

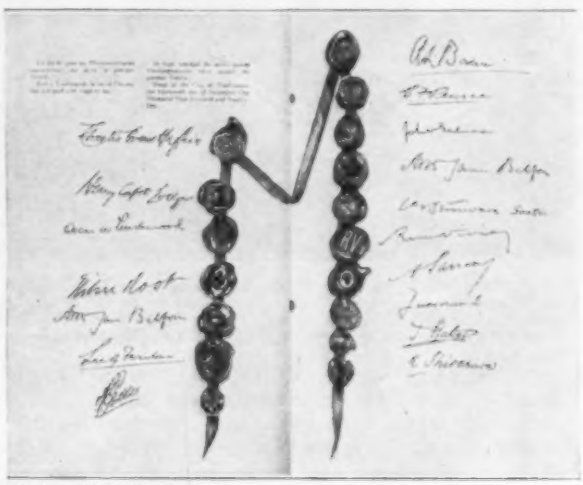
The striker seems to take an inexplainable sense of independence in going on strike, but if those who have been indulging in the occupation of striking, or are thinking of doing so, would take a pencil and sit down to figure out the net result with their wives, they would then be in a better position to answer to themselves the somewhat essential question—"Does it pay?"

Strange how seldom a strike occurs where there is one employer and one employe!

H. H. WINDSOR

## NINETEEN SIGNATURES TO "FOUR-POWER TREATY"

Eighteen delegates signed the "Four-Power Treaty" which was adopted by the Conference for the Limitation of Armaments, but there are, in fact, 19 signatures to the act. The four delegates representing the United States, headed by Secretary Hughes, signed first. They were followed by the seven British delegates, headed by Arthur James Balfour, who signed twice, once for the United Kingdom of Great Britain and Ireland, and once for the Union of South Africa, the only division of the British Empire not having a special delegate; the three French delegates, led by Réné Viviani, and the four Japanese delegates, led by Baron Kato. Seals were first affixed to the document and each delegate touched his seal, when he signed, to indicate that it was official. The single original copy, written on parchment and bearing the official seals and signatures of the several delegates, will be preserved in the archives of the State Department of the United States, but a certified copy will go, for ratification to each of the contracting governments. The entire subject matter of the treaty is printed in English and French.



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Facsimile of a Page of the Treaty, Showing Signatures of the Delegates: Two Japanese Signed on the Next Page

According to earlier usage the document would have been printed in French and in each of the languages of the signatory powers.

## PREHISTORIC HUMAN SKULL OF NEW TYPE DISCOVERED

Another link in the development of the human race was recently discovered in the south-central portion of Africa. The open quarry excavation of the Broken Hill Mine, in northern Rhodesia, contains what is known as "Bone Cave." In this cave many tons of bones have been discovered. These included bones of many different kinds of animals, but none of extinct species or of human beings. Recently, at the extreme end of the cave, one human skull was found. Some portions of the skeleton were also recovered, but most of the bones were broken to pieces by the native laborers, who were ignorant of their scientific importance. The skull, which has been presented to the British Museum by the mine owners, is different from any prehistoric skull previously found. Though it resembles a southern European type, it undoubtedly represents a more advanced stage of development. The scientists of the British Museum hope, with more thorough study, to determine its exact place in the development of the race.

The Broken Hill Mine in Northern Rhodesia: The Small Circle Marks the Spot Where the Prehistoric Skull was Found, When the Open Quarry Work Uncovered the End of "Bone Cave." In the Large Circle the Skull is Shown in the Position in Which It was Discovered

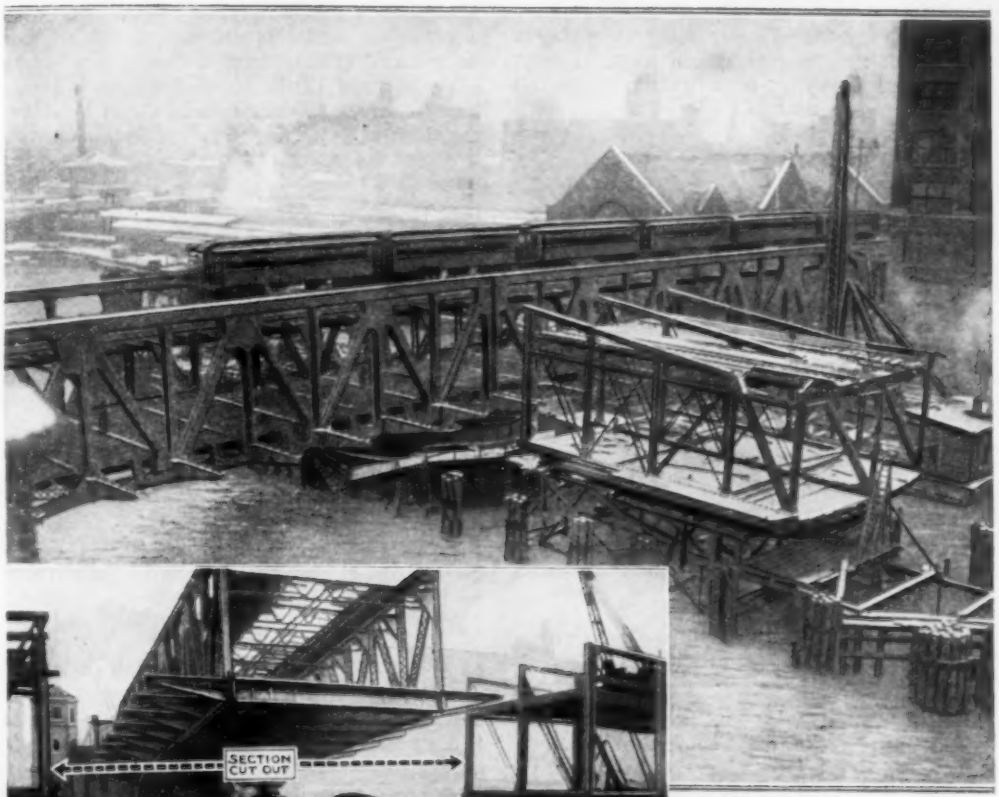
## NEW STRATEGIES EMPLOYED IN WAR ON BACTERIA

In years past, great stress has been placed on the bacteria which are responsible for disease, and attempts to reduce human ills were largely made by trying to destroy the organism which produced them. Recently the tendency has been to combat disease germs not so much by efforts to eliminate them entirely by direct means, which is a matter of extraordinary difficulty, but by making conditions unfavorable for their growth, as illustrated in part by the vaccines and antitoxins which are coming more and more into use.

It has been found that stone masons, under certain conditions, appear somewhat susceptible to consumption on account of silica dust inhaled reaching the lungs. Recently it has been determined that this dust does not operate directly as an irritant on the tissues, as was first assumed, but appears to act as a sort of fertilizer for the bacteria, making it easy for them to flourish, once they gain access.

Attention now is being directed toward finding repellent materials of satisfactory character. It is well known that immunity from diseases, or capacity to resist or render them mild in form, apparently comes from the ability of the body, in course of time and acting through several generations, to elaborate or produce these counteracting or, one might say, defertilizing substances. In the future, further understanding of the problem may permit the laboratory to aid man more directly by producing these substances as they are needed to reduce old diseases or to combat new ones.

# CLEVER ENGINEERING SEEN IN OPENING NEW BRIDGE




PHOTO, UNDERWOOD & UNDERWOOD

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**Above: The New Double-Deck Bascule Bridge in Use after being Lowered into the Opening Cut in the Old Center-Pier Bridge. Traffic was Closed for Only 48 Hours, While the Cut was being Made. Left: The South Section of the New Bridge being Lowered into Place. At Each Side the Edges of the Old Bridge, Which Also Was a Double-Deck Structure, can be Seen, Showing How It was Cut Away to Make Room for the New Structure, After It had First been Swung Open**

The opening of the new Wells Street bridge, by which one of the elevated railroads of Chicago crosses the main branch of the Chicago River, marks the completion of what is considered a particularly clever piece of engineering. This new double-deck bascule bridge replaces an old structure of the center-pier type. The two sections of the new bridge were built standing upright, over and around the ends of the old structure, without interrupting traffic until they were fully completed. The old bridge, which was also double-decked, was swung open, and a section cut from its center with oxyacetylene torches. The new bridge was then lowered into the opening, and traffic was resumed after a delay of only 48 hours. The wrecking and hauling away, in barges, of the old bridge then proceeded without interfering with traffic. The new structure, of the most modern type, weighs 5,000 tons and was built at a cost of approximately 1,000,000 dollars.

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¶Snow, in engine terminals of Canadian railroads, is being satisfactorily disposed of by the use of steam coils in the turntable pits. This not only keeps the turntables clear, but makes the pits available as snow melters. Snow is thrown into the pits, melted, and carried off by the drains.

## WELDING-TORCH EQUIPMENT CONVENIENTLY PORTABLE

Specially adapted for use in garages and small machine shops, a new welding torch and carrying-case outfit has been placed on the market. It is a complete oxyacetylene-welding equipment that can be packed in a fiber case, with a handle that makes it conveniently portable. The equipment consists of one torch, three extension tubes, five welding tips, one decarbonizing tube, one oxygen and one acetylene regulator, with 12 ft. of hose for each, one spark lighter, one pair of colored glasses, one torch, and one regulator wrench.

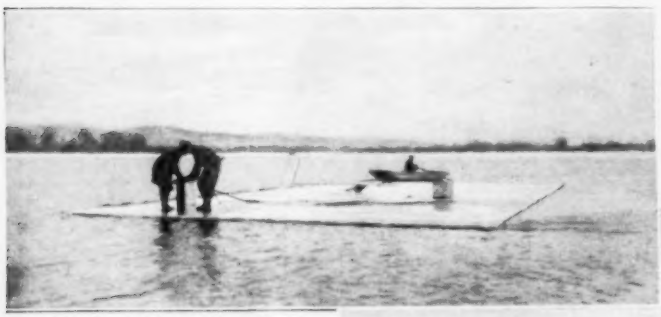
Complete Oxyacetylene-Welding Equipment Packed in Convenient Portable Fiber Case with Handle and Metal Hinges and Fasteners

## SORGHUM SIRUP MANUFACTURED BY IMPROVED METHOD

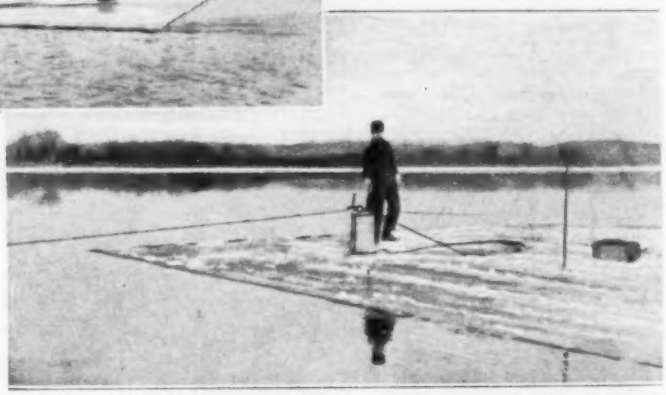
Raising of pedigreed cane, improvement of chemical operations, and a general cheapening of the processes of manufacture, are three features that have been introduced into the production of sorghum sirup. A cleaning machine has been developed, that does away entirely with handwork in the harvesting and cleaning of cane, and is said to have cut the labor cost nearly in half. The waste from the cane is now constantly fed into the fire boxes in these plants, and constitutes 85 per cent of the fuel used.

## CABLE-FERRY SYSTEM FLOATS ICE ACROSS RIVER

During open winters, men harvesting ice on the rivers and lakes of the northern states are driven to many expedients to obtain the ice. In many places only the quiet waters of rivers freeze, leaving the main channel open, and it is difficult to get the ice across the channel to the shore. At an Iowa town, where ice is cut extensively for the railroads and inland communities, a cable-ferry system is used. The cable is stretched from the shore across the open channel to the ice field, about half a mile away and slightly upstream. Ice is cut in cakes about 40 ft. square. A piece of plank, having a length of rope tied to it, is dropped through a hole in the cake, and the other end of the rope is attached to a pulley mounted horizontally on a wooden block, which is thus anchored to the ice floe. The ferry cable runs over this



An Ice Cake being Carried along the Ferry Cable, Using the Current to Transport the Ice across the Open Channel

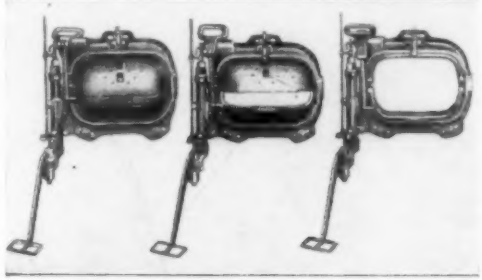


The Block and Pulley, over Which the Cable Runs, are Anchored to the Ice by a Rope and Plank, Dropped through a Hole in the Cake

pulley, and the pressure of the current against the ice cake forces it along the cable to the shore, where it is pulled in by hand.

## AUTOMATIC FIRE DOOR FOR LOCOMOTIVES

Locomotive fire doors, whether automatic or not, interfere, when they are opened, to some extent with some of the appliances behind the boiler head. An improved fire door that occupies exactly the same space whether opened or closed, consists of two semirotating door plates, an operating cylinder with pedal for power operation, and a grip for manual operation. In operating it by power, pressure on the pedal admits air to the cylinder, moving its piston upward, which by a link connection rotates the upper door on its pivots and opens it. By means of a bell crank and link, the movement of the upper door is communicated to the lower one reversely, rotating it to



Locomotive Fire Door That Opens by Pressure on Pedal, Which Admits Air to the Operating Cylinder, Moving the Piston Upward: Link Connections Open Upper and Lower Door Plates

the open position also. When the pressure is removed from the pedal, the doors close automatically, and are cushioned by the air so that they do not slam.

## SIT THREE WEEKS IN COLD TO REGISTER FOR LAND

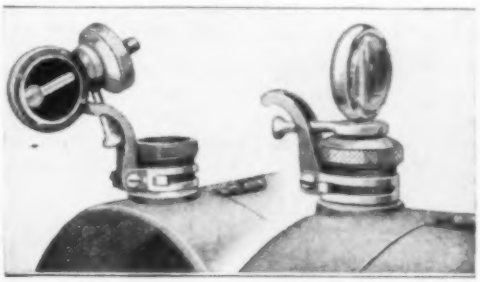
Three weeks of patiently sitting in the bitter cold of Calgary, Can., was the trying experience of two land seekers who were determined to be the first to register for the valuable oil lands recently thrown open by the government. The usual custom of the land office is "first come—first served," hence the desire to head the long line, which always forms on an occasion of this kind, in order to get the choice of the land. The two men who sat exposed to the elements for nearly a month, were adequately provided with blankets, robes, and even specially prepared booths. The booths were light boxes with a covering of heavy canvas, much resembling a portable steam-bath outfit. Inside of the

These Men, Bundled in Robes, Blankets, and with a Lighted Lantern beneath Their Chairs, are Waiting for the Opening of the Land-Office Registry

booth was a chair, with a lighted lantern underneath, the heat from which kept the men from freezing while they slept in their seats.

## LOCKING DEVICE FOR RADIATOR CAP AND THERMOMETER

By using a new locking device, the danger of losing the auto radiator cap and thermometer, or of forgetting the key which locks them, may be avoided. A collar is riveted about the inlet of the radiator. A slotted arm curves up from the collar, and a pin, terminating in a knob, passes through the slot. The other end of the pin is formed into a ring, within which the radiator cap revolves. The cap



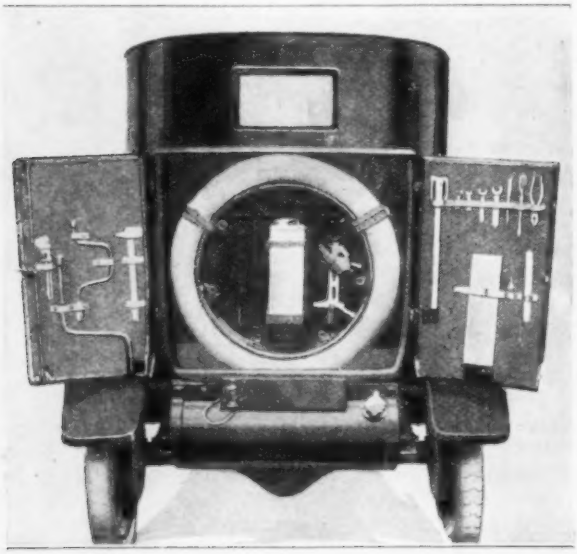
Left: Radiator Cap Unscrewed and Tilted Up, but Still Attached to Machine. Right: Cap in Place

is simply unscrewed, and the whole thing tilted up when the radiator is to be filled.

¶A new paper-backed photographic film has been introduced in Germany. It is cheaper than celluloid film, but as good, and is particularly suited for X-ray work.

## NEW FRENCH CAR HAS LOCKER IN THE REAR OF BODY

One of the latest-model French automobiles is provided with doors in the back of the body which, when swung open, give access to a locker. Inside the locker is space for carrying a spare rim and tire, cans of oil, an emergency supply of gasoline, tools, and extra parts. When closed, it presents a neat appearance with all the equipment out of sight, but readily accessible if needed for emergency repairs when on the road.



Rear Locker, for Tools and Extra Parts, in New French Machine: The Doors Close, Forming a Neatly Finished Back

## BRONZE FOR WEATHERPROOFING IN BRIDGE CONSTRUCTION

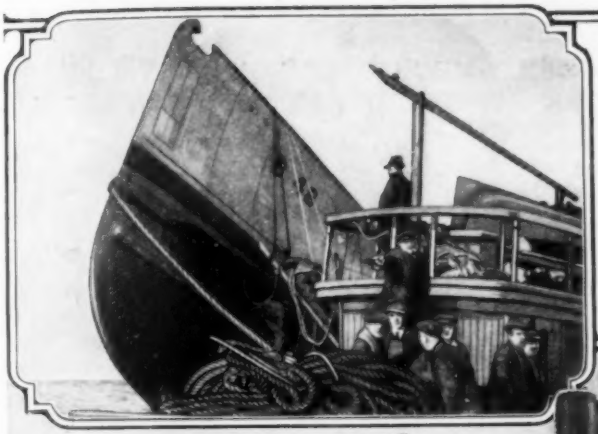
Bronze as a substitute for paint for preserving structural steel, particularly where it is exposed to the weather as in a bridge, has the advantage of being a permanent weatherproofing material, and, therefore, of avoiding the cost of repeated renewals. For this reason bronze will be used as a protective covering for nearly all the steel in the Hudson River suspension bridge, the $100,000,000 proposed structure that is to connect Manhattan Island with the New Jersey shore. It will be the first time that this method of weatherproofing has been applied in a structure of anything like the immensity of this suspension bridge, with a central span of 3,240 ft. and approaches of 1,650 ft. each. It is estimated that it will result in an annual saving of $400,000 in the upkeep of the structure. Each of the four trussed cable systems from which the bridge is to be suspended will be completely inclosed in a continuous bronze gallery, provided with enough doors to permit occasional inspection. Similar methods will be adopted in other parts of the bridge where the steel is exposed to the weather.

¶Improved accuracy of American-made weights is shown by recent tests, only seven per cent failing to meet requirements.

## PEACE-TIME PERILS OF SUBMARINE SERVICE

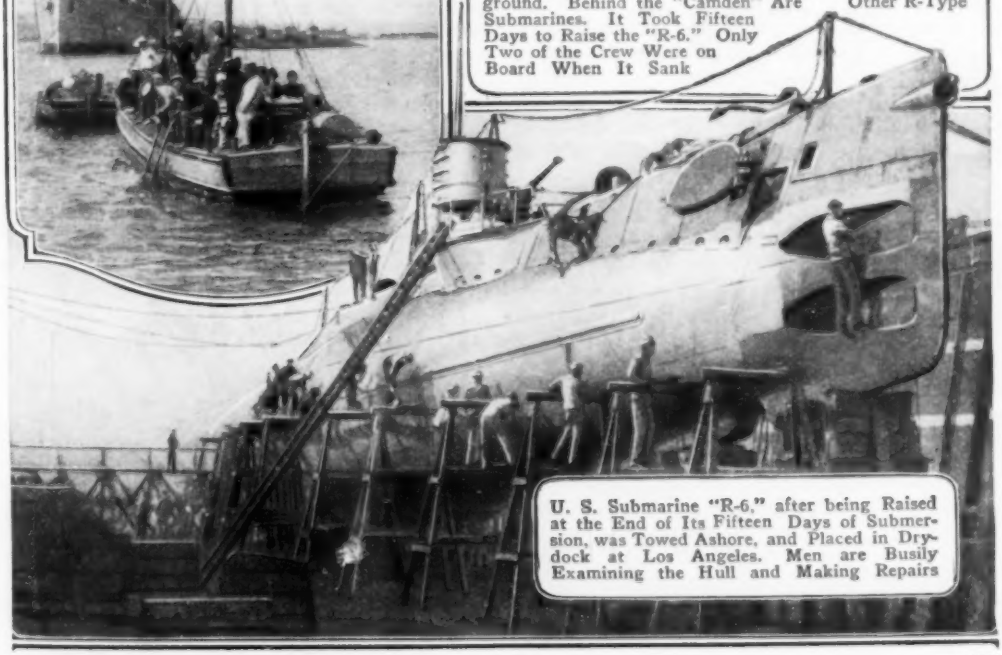
To the submarine sailor, as to the airman, there are perils of peace when there is no war. From their nature, the least mishap in either endangers the lives of the human occupants. In the case of the submarine this has been strikingly exemplified by two recent accidents. On September 26, the "R-6" suddenly filled with water and sank in less than two minutes, while moored alongside the tender "Camden," off Los Angeles. Fortunately, most of the crew were at supper aboard the tender, and only two lives were lost. There then arose the problem of raising the submarine. As the depth was only 35 ft., it was easy for divers to work on the sunken hull, and this was done from a 40-ft. tug that was anchored at the spot. After the hull had been made air and water-tight, pumps on the tug succeeded in replacing the water in the hull with air. Fifteen days after the sinking this was accomplished, and the giant submersible then slowly rose to the surface, where it finally rested on an even keel.

The other mishap was to the "S-48," off Bridgeport, Conn., when this submarine was submerged for 12 hours before the 41 members of the crew, after blowing the water out of some of the ballast tanks, succeeded in raising the vessel's bow above the surface so that they were able to escape through a torpedo tube. Then, perched upon the exposed bow, they waited for 10 hours, until finally they attracted the attention of a passing steamer, and were picked up and taken ashore. Only three of them required medical attention.



Below: U. S. Submarine "S-48," Sunk near Bridgeport, Connecticut. The Photo Shows the Exposed Bow of the Submarine from Which the 41 Members of the Crew Escaped through a Torpedo Tube, and were Later Rescued by the Tug Shown Alongside. Left: Wrecking Tug That Rescued the Crew of the Submarine Shown Lashed to the Exposed Bow. At the Time the Photo was Taken a Member of the Crew was Entering the Torpedo Tube through Which the Trapped Crew of the Submarine Escaped

Left: In the Foreground Is the Small Tug Engaged in Pumping the Water Out of the U. S. Submarine "R-6" Which Sank Suddenly While Moored alongside the Submarine Tender "Camden," Seen in the Background. Behind the "Camden" Are Other R-Type Submarines. It Took Fifteen Days to Raise the "R-6." Only Two of the Crew Were on Board When It Sank



U. S. Submarine "R-6," after being Raised at the End of Its Fifteen Days of Submersion, was Towed Ashore, and Placed in Drydock at Los Angeles. Men are Busily Examining the Hull and Making Repairs

## MACHINE FOR CUTTING MORTAR FROM JOINTS OF BRICKWORK

A special machine was recently placed on the market which is intended for cutting out the mortar between bricks. It

A Workman Removing Mortar between the Bricks of a Wall with the New Machine: Goggles Protect His Eyes from Flying Bits of Mortar

consists of a small wheel which is operated at 3,500 r.p.m. by a flexible shaft from a ¼-hp. electric motor. A case, partly covering the wheel, extends down to form a handle, and a safety guard is provided to protect the operator's hands from flying bits of mortar. Wheels of various thicknesses are supplied so that they may be changed to fit layers of mortar of different width.

## IMPORTS OF EGYPTIAN COTTON CARRIED IN AMERICAN SHIPS

Exports of Egyptian long-staple cotton to the United States have always been very considerable, exceeded only by those to the United Kingdom. Egypt is still suffering from the effects of the cotton crisis, during which, in the year 1920, there was a decline of price, at normal exchange rates, from $1.60 to 20 cents per pound. A partial cause of this was a corresponding decrease in the amount of cotton exported, but in spite of that there were shipped to the United States during the first nine months of 1921, over 42,000,000 lb. of cotton. Up to the present, the carrying of these heavy shipments has been a monopoly enjoyed by British liners, and it is therefore gratifying to learn that, on Nov. 16, 1921, a contract was signed between various British steamship companies and the Emergency Fleet Corporation, by the terms of which 50 per cent of all cotton shipments from Alexandria to the United States, whether consigned directly or via British ports, may be carried in American bottoms.

## CONVEYOR UNLOADS AND PILES STONE FOR STORAGE

An original means of storing stone for future use in concrete work, in connection with highway construction, has been devised by an eastern contractor. A conveyor that carries the stone from the loaded car to the storage pile is supported on cribbing made of railroad ties. This cribbing is added to as the pile of stone increases in height. It is claimed that it is possible to pile about 50 tons of stone an hour in this manner.

Conveyor for Unloading and Storing Stone for Future Use in Highway-Construction Work: The Conveyor is Supported on Cribbing Made of Railroad Ties Which are Added To as the Height of the Stone Pile Increases. It is Claimed That 50 Tons of Stone an Hour can be Piled in This Manner

One Hundred People, the Entire Population of Fort Rock Valley, Oregon, Which Covers 100 Square Miles, Turned Out to the Opening of the Well Which Proved the Desert Valley can be Made a Garden Spot

# ABANDONED SETTLEMENT RECLAIMED BY WELLS

By HORACE E. THOMAS

DEVELOPMENT of a great arid waste that was being abandoned to the sagebrush and the jackrabbit is foreshadowed by an experiment that has been conducted by the state of Oregon. Irrigation from wells is expected to redeem vast stretches of desolate and barren plains. The first well has been completed with money appropriated by the state legislature, and geologists employed to make a survey declare that the whole Fort Rock basin of central Oregon, in which the experiment was made, is underlaid by an abundant supply of water.

When a railroad was built into central Oregon in 1910 there was a great rush of homesteaders attracted by the opportunity. Cabins sprang up over the prairie, and the settlers began to till the soil. But in the Fort Rock Valley, a few seasons completely chilled the enthusiasm with which they had entered upon their pioneering. So parched was the land, so small the rainfall, that even approved methods of dry farming failed to wrest a living from the reluctant earth. No feasible method of irrigation was available, and the discouraged settlers moved away, most of them having lost live stock and other possessions they brought with them. Soon the valley became a district of abandoned ranches, with only a handful of people left—those who were too poor to move away, and a few who still believed in its agricultural possibilities.

So distressing was the situation, that an appeal for help to the state legislature gained an appropriation of $10,000 to determine whether the land might be irrigated from wells. It was hoped to find an artesian supply, but this was not realized. There was tapped, however, a great reservoir of water at a depth of about 100 ft. below the surface. It lies in a basin formed by layers of hard basaltic lava, and is practically inexhaustible.

When the first well was completed, the people in that part of Oregon were invited to witness a demonstration. There was present the entire population of the Fort Rock Valley, 100 persons, living in a district of 100 square miles, and others from near-by valleys. A turbine pump driven by a tractor raised water at the rate of 600 to 800 gal. a minute. In the first few minutes the surface of the water in the well fell slightly. Then it remained stationary during the six hours that the pumping continued. Although the well was drilled to a depth of 220 ft., the water level was only 25 ft. below the ground. At the average flow of 700 gal. a minute, the well will supply sufficient water to irrigate 200 acres of land and transform it from a barren desert into a garden.

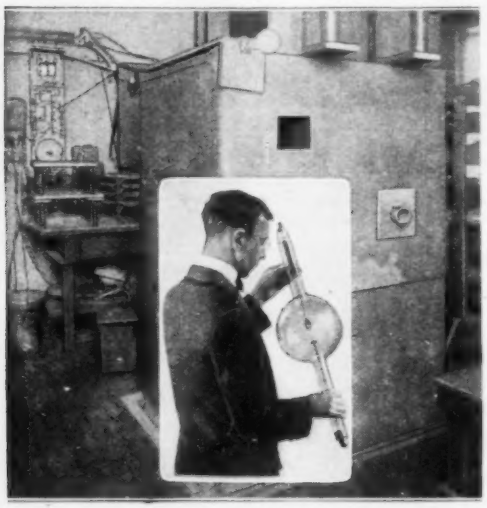
The state authorities who conducted the experiment pronounce it a success in every particular. Sufficient money remains of the appropriation to bore two additional wells, which will be located in

other parts of the valley to prove that the supply is uniform. Then the situation will be left to the resources of the ranchers.

It is expected that many more wells will be sunk and that the desert will be made to bloom, just as it has elsewhere where gravity irrigating systems have been installed. A day is looked forward to when the deserted farms will be rehabilitated and the owners, freed of the discouragement that drove them away, will return with new hope and confidence in the land that once failed them.

## X-RAY TUBES EXPERIMENTALLY OPERATED AT 300,000 VOLTS

Development of X-ray apparatus has reached a more advanced stage in this country than most people imagine. Recently X-ray tubes have been built which operate experimentally at 300,000 volts. These are among the highest-power tubes ever constructed. The test of these instruments is a delicate and dangerous task. In conducting the test, the operator stands within a lead-inclosed cabinet from which he can observe the behavior of the tube.



Laboratory Containing Lead-Lined Cabinet for Testing High-Power X-Ray Tubes: The Insert Shows One of the Recently Built 300,000-Volt Tubes

## RECORD OF POWER RESOURCES KEPT BY WAR DEPARTMENT

As a war-preparedness measure, the engineering division of the War Department has decided to compile and maintain an inventory of all available electric-power resources of the whole United States. This will be done by the coöperation of all the power-producing concerns in the country, who will furnish the engineers of the War Department with information of the maximum output which can be maintained by each of their plants, and of the power uses, and the needs of the large power consumers, in each district. It will also be ascertained to what extent each district is surveyed for development of increased power resources, so that the government will know the best means of developing these resources, and of administering the distribution of power in case of war.

## INSTRUMENT UPON DASHBOARD GIVES WARNINGS TO DRIVER

Located on the dash of an automobile, a recently developed instrument, by flashing red lights in three small windows, shows the driver when the oil in the crankcase gets too low for safety, when the water in the radiator is approaching the boiling point or the freezing point, and also when the level of gas in the reservoir reaches any minimum for which it is adjusted. Thus the auto driver is provided with a positive warning against burnt-out bearings from lack of oil, against delay because of gas shortage, against overheating of the engine, and against damaging the radiator by frost.

Three Small Windows on Auto Dash, in Each of Which a Red Light Flashes, Warning the Driver of Lack of Oil, Gas Shortage, or Overheating of the Radiator

# VENTILATION PROBLEMS SOLVED IN TEST TUNNEL

By S. R. WINTERS

IMMUNITY from ill effects of carbon monoxide—a poisonous constituent present in gases discharged by exhaust systems of automobiles and motor trucks—when operating vehicles through a tunnel, is assured if persons are not exposed to more than 4 parts of carbon monoxide to 10,000 parts of air. This is the outstanding conclusion of a series of tests completed on November 1, last year, in a test tunnel constructed by the Bureau of Mines in connection with its experimental mine at Bruceton, Pa. Coöperating with the New York and New Jersey State Bridge commissions, the bureau built an experimental tunnel to study ventilation problems when automobiles operate underground. The results of the investigation are particularly applicable to the regulation of air adequate to the use of the 9,000-ft. tubes to be used as traffic passageways between New York City and New Jersey under the Hudson River.

Air-Sampling and Temperature-Measuring Station at Entrance to Experimental Tunnel: Forty-Eight Samples from Different Parts of the Tunnel are Taken to This Station for Testing. Temperatures in All Parts of the Tunnel are Measured

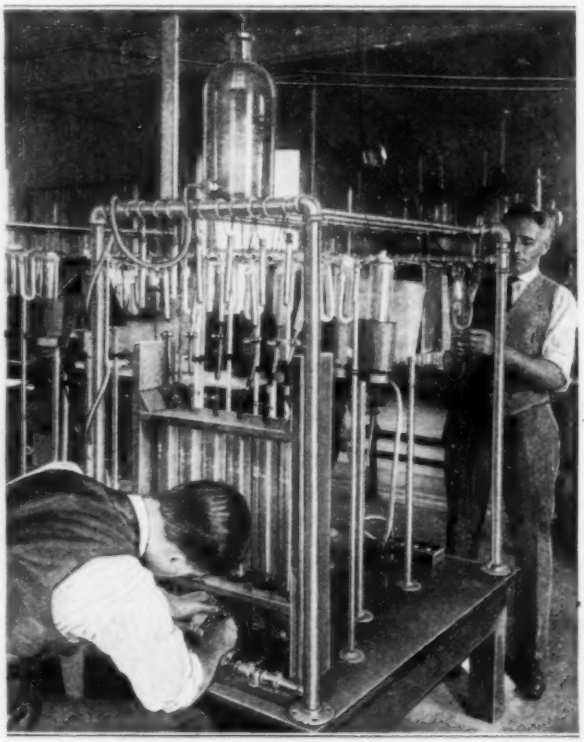
Taking a Sample of the Gas from the Exhaust Pipe of One of the Motor Trucks Used for Making Observations in the Experimental Tunnel: There Were Several of These Trucks in the Tunnel, Each Carrying the Driver and at Least One Observer

The underground roadway is located on the outskirts of Pittsburgh. It consists of an oval track, tunneled under the surface of the ground. It penetrates 130 ft. below the ground and is situated 1,050 ft. from the pit mouth of the mine. The axial length of the track is 400 ft., with a cross section 9 ft. wide and 8 ft. high. Above the ceiling of the tunnel is an air duct, 3 ft. high, and below the floor is a like unit, 2½ ft. high. Both of these ducts either introduce fresh air or discharge foul or poisonous atmosphere.

Elaborate and sensitive apparatus is found in the experimental tunnel, including units for determining the temperature, humidity, volume, rate of flow, and pressure of the air in all sections.

Forty-eight air-sampling tubes, placed along the tunnel, form a complete equipment for obtaining samples of air for chemical analysis, and for determining the spreading and concentration of the exhaust gases in various por-

tions of the tunnel, under different methods of ventilation. A car collecting samples of atmosphere is continuously in operation through the tunnel while observations are in progress. Fresh air is introduced through horizontal slots in expansion boxes near the floor of the underground track. Impure air is discharged through a center opening in the ceiling. Physicians periodically take blood samples from the arms of the drivers of automobiles to ascertain the percentage of carbon monoxide absorbed by the blood.



Apparatus for Making a Chemical Analysis of the Experimental-Tunnel Atmosphere in Order to Determine the Percentage of Carbon Monoxide

Eight lightweight automobiles, spaced at 50-ft. intervals and operating at a speed of 10 miles an hour, were used in the observation tests. From 21,000 to 28,000 cu. ft. of air a minute, or a volume sufficient to maintain a ratio of 4 parts monoxide to 10,000 parts of air, was forced through the underground oval track. Each driver and observer participating in the tests was subjected to examination before and at the conclusion of the performance by physicians and physiologists. The quantity of carbon monoxide absorbed by each participant in the experiments was revealed by examination of drops of blood extracted immediately after the tests. Sensitive apparatus for making these blood analyses was developed by the Bureau of Mines. The influence of smoke and temperature on the drivers of the automobiles was determined also. The improvised tunnel has a constant temperature, free from fluctuations and leakages common to models built above the surface of the earth, and the ground temperature surrounding it approximates that underneath the Hudson River. The air was heated and humidified as representative of an extreme condition during the final observations.

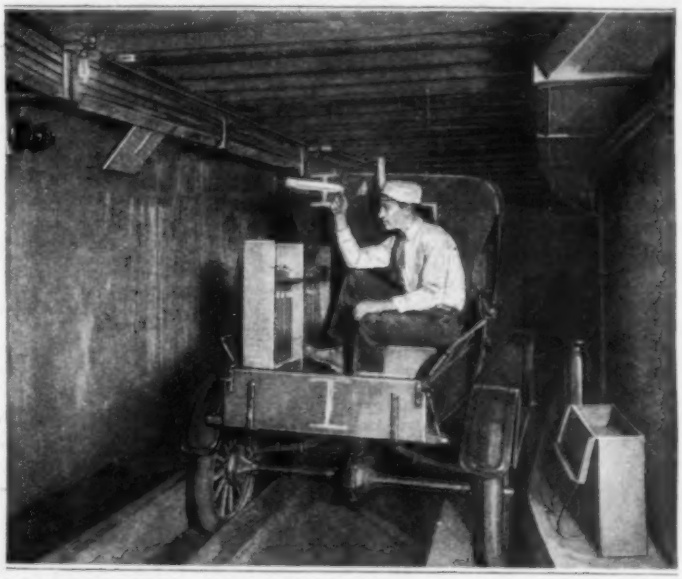
Surgeon Taking Sample of Blood from Arm of Driver of One of the Test Cars After He had Driven the Car One Hour in Experimental Tunnel

Each automobile transported a driver and from one to three observers. From two to ten other observers remained stationary or walked alongside the passageway in an effort to check the accuracy of the preliminary tests. Thus sometimes as many as 42 persons submitted themselves to the influence of the gas given off by the automobiles for a period ranging from one to two hours. Air was introduced from varying angles—at the bottom and top of the ventilation system—to find out the method yielding the most efficient ventilation at a minimum air circulation. Purposely, the engines of the cars were so adjusted as to yield a substantial volume of smoke. The result was without variation, that the smoky exhaust ascended behind the automobile

toward the ceiling. Upward or downward ventilation produced this effect invariably. Presence of considerable smoke in the tunnel was a condition readily met by stopping the automobiles.

From the results of these observations, the investigators are unanimous in the conclusion that no ill effects will be sustained by persons exposed to carbon monoxide in the dilution stated above. Earlier experiments with both animals and men at the physiological laboratory of Yale University, under the direction of Dr. Yandell Henderson, consulting physiologist of the Bureau of Mines, had established this ratio of carbon monoxide to air as being safe. This conclusion is applicable to mines and blast furnaces as well as to vehicular tunnels. An increase in humidity and temperature to 88° F., as measured by the wet-bulb thermometer, did not influence the results as far as causing bad effects is concerned, although subjects were exposed for one hour 10 minutes. This figure represents the maximum heat and humidity that could possibly occur in the Hudson River tunnel.

The results of the study of the Bureau of Mines may be accepted as final. The tests were planned as checks on the conclusions arrived at in the investigations at Yale University just referred to and that of the University of Illinois relating to the volume of fresh air necessary to the functioning of the Hudson River tunnel. Road tests on 101 automobiles and motor trucks at the Pittsburgh Experiment Station likewise revealed the percentages of carbon monoxide discharged by individual vehicles. The range is from .5 to 14 per cent. Passenger cars and speed motor trucks operating on level grades at 15 and 20 miles an hour averaged 7 per cent; motor trucks ranging from 1½ to 5-ton capacity, traveling at a rate of 10 miles an hour, 7.3 per cent.



Reading Temperature and Humidity in Atmosphere of Tunnel: Fresh Air is Admitted from Openings Near Floor, and Vitiated Air is Removed through Opening in Ceiling, or Vice Versa

## CHAIR-BED HAS BOOKSHELF AND MEDICINE CABINET

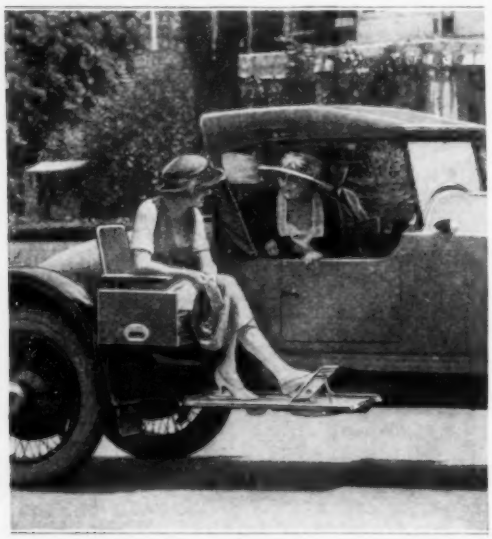
Invalids, book lovers, and smokers should be interested in a new reclining chair, which combines a number of features. A small compartment in the side can be used as a medicine cabinet, or to contain the smoker's needs. Between the front legs is a shelf for holding books, and to the right arm can be fitted a detachable writing table.

Left: Chair-Bed Showing Bookshelf. Right: Chair-Bed Showing Cushion Unfolded, Medicine Chest and Writing Table

Besides these advantageous points, the chair has the additional feature of being convertible into a bed, so that it is a useful piece of furniture not only in the daytime but also during the night.

## DRAWERLIKE SEAT SLIDES INTO SIDE OF AUTO BODY

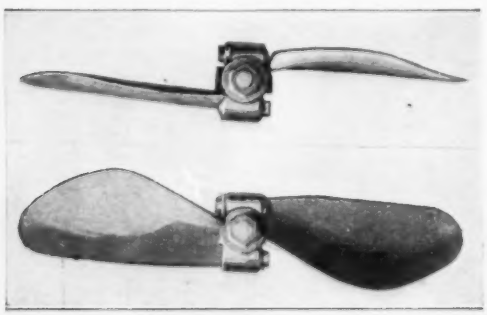
An extra seat, which pulls out of the side of the car body like a drawer, is a feature of one of the latest-model runabouts. The back and armrests fold into the drawer, which is entirely out of the way when not in use. For the comfort of the occupant, a short running board is provided, a section of which is hinged so that it can be raised to form a footrest and brace.



When Pulled Out, This Drawer Forms a Comfortable Extra Seat. At Other Times It Fits Neatly into the Side of the Body of the Car

## PROPELLER MADE ADJUSTABLE FOR WIND OR MOTOR DRIVE

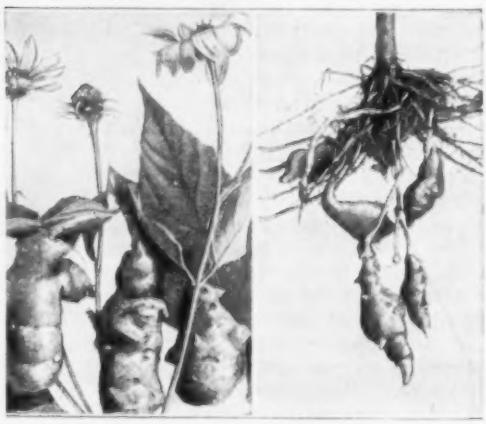
Ordinarily a propeller on a sailing vessel possessing an auxiliary engine, would prove to be a hindrance when the engine is not in use, but an adjustable-bladed type has been introduced, which automatically adjusts itself so as not to be a "drag" on the boat when idle. The blades of this propeller turn loosely in a bearing on the shaft, and when sails are used, the blades revolve in the bearings until their edges are alined with the ship's course, in much the same manner as a weathervane adjusts itself to the wind. When it is found desirable to employ the engine, the revolving of the engine shaft brings the blades back to their original position again, for the purpose of propelling the boat.



Above: Adjustable Propeller Alined with Course of Ship When Sails are Used. Below: Position of Propeller When Engine is Used

## POSSIBLE SOURCE OF SUGAR PRODUCTION DISCOVERED

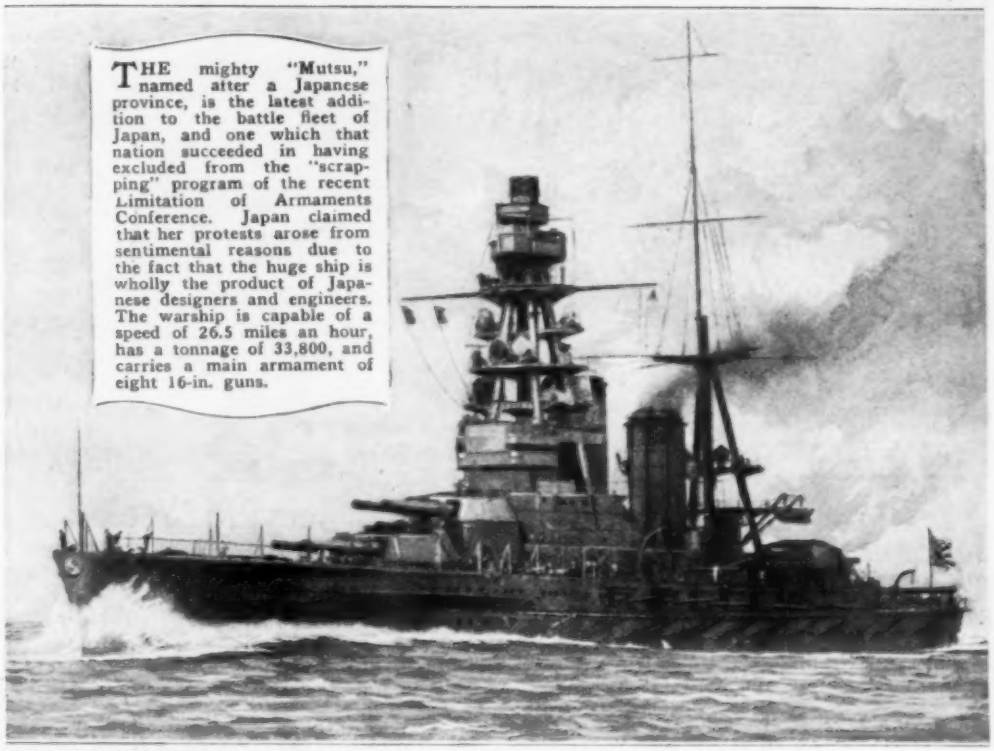
Sugar may be obtained from a new source as a result of a recent discovery made by the United States Department of Agriculture. It has been found that a substance, known as inulin, which has a 60-per-cent greater sweetening quality than the sirup made from sugar cane, can be extracted from the tubers of the Jerusalem artichoke, a plant related to the common sunflower. The discovery is so new, that so far it has been impossible to make complete tests of the commercial possibilities of this plant as a source of sugar. The plant is most prolific, however, needing only to be planted once, after which it reproduces itself each year. In fact, it is considered a pest in some parts of the country. In the past these tubers have been used for making pickles by saturating them with vinegar. The Jerusalem artichoke is a native North American plant and was used as a food by the Indians, before the coming of white men.



Left: Flowers, Leaves, and Tubers of the Jerusalem Artichoke. Right: The Tubers, Showing How They Grow on the Roots of the Plant

# MIGHTY "MUTSU" IS LATEST JAPANESE BATTLESHIP

THE mighty "Mutsu," named after a Japanese province, is the latest addition to the battle fleet of Japan, and one which that nation succeeded in having excluded from the "scrapping" program of the recent Limitation of Armaments Conference. Japan claimed that her protests arose from sentimental reasons due to the fact that the huge ship is wholly the product of Japanese designers and engineers. The warship is capable of a speed of 26.5 miles an hour, has a tonnage of 33,800, and carries a main armament of eight 16-in. guns.



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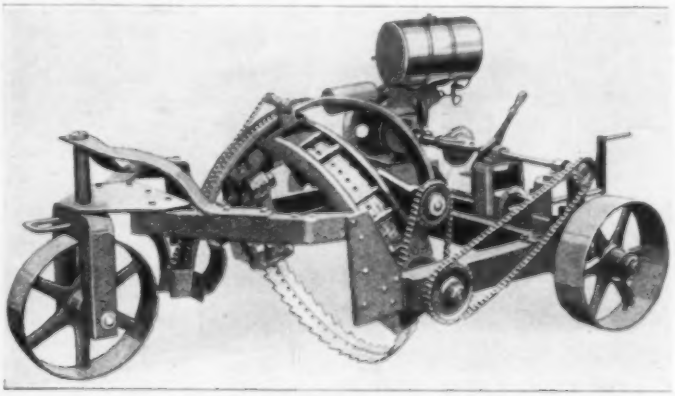
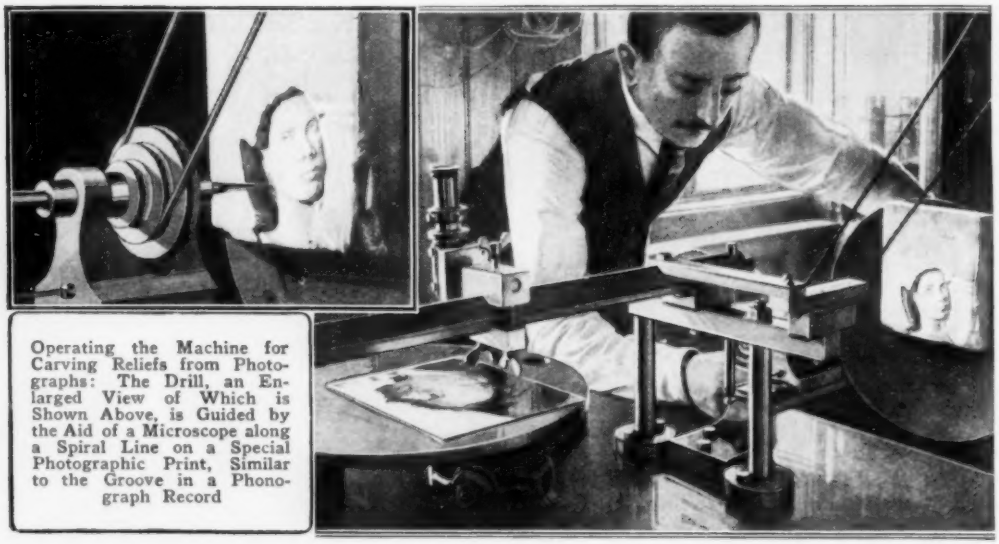
## POWER-DRIVEN STUMP CUTTER DOES ITS WORK RAPIDLY

Tree stumps can be cut off at ground level, or as much as 30 in. below, very rapidly by a machine that does the cutting with a sort of combined band and circular saw, for though it is flat, like a band saw, it is ⅝ in. thick, and maintains its circular shape. The saw is rotated rapidly by a small gasoline engine, and when cutting below ground, it is started some distance from the stump, and is sloped and fed downward so that it descends into the ground and strikes the stump at the desired depth. After cutting through the stump the slope of the saw is reversed, and it proceeds to cut upward, ending by having cut out a saucer-shaped section of the ground containing the tree stump. The saw is made of the same material as stone-cutting saws. The machine is mounted on wheels, making it easily portable. It is made in two sizes, with saws of 8 and 12 ft. diameter, respectively.



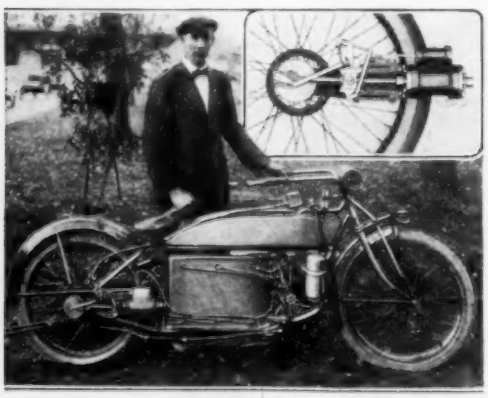
Machine for Cutting Tree Stumps at Ground Level, or 30 Inches below It: The Circular Band Saw Cuts through the Stumps While It is being Rotated Rapidly by the Small Gasoline Engine at the Rear.



Operating the Machine for Carving Reliefs from Photographs: The Drill, an Enlarged View of Which is Shown Above, is Guided by the Aid of a Microscope along a Spiral Line on a Special Photographic Print, Similar to the Groove in a Phonograph Record

## STEAM-DRIVEN MOTORCYCLE ECONOMICAL TO OPERATE

An economical steam-driven motorcycle has been built by a Denver, Colo., man, and as there are no gears, chains, belts, or clutches, it is practically noiseless. The inventor claims that the machine develops a speed of 60 miles per hour from a standing start, within a distance of 174 ft., and that 1 gal. of kerosene furnishes sufficient steam to travel 35 miles. The driving power is applied directly to the axle of the rear wheel, by a two-cylinder single-expansion double-acting engine. It is estimated that the steam machine can be operated at one-fifth the cost of a gasoline motorcycle, not including the saving in tires due to the smooth, even application of power.



Steam Motorcycle Showing the Kerosene and Water Tanks and Various Piping. Insert: Engine and Eccentric on Rear Axle

## "PHOTO SCULPTURE" CARVES RELIEFS FROM PICTURES

At the Royal Photographic Society exhibition, in London, Eng., a demonstration was recently made of a process of "photo-sculpture." The subject to be photographed is illuminated by a projector which throws a spiral of light, similar to the groove in a phonograph record, upon it. This spiral is distorted, on the negative, by the irregularities of the subject. A positive is made, on glass, to be used in the carving machine. This has a disk, to hold the material to be carved, a carrier for the photographic record, and a microscope and high-speed drill, mounted together. The operator moves the microscope so that the cross hairs follow the spiral lines of the photograph. This moves the drill so that it cuts the material at varying depths according to the form of the subject. In this way excellent reliefs have been obtained in wood, ivory, and alabaster.

## RATTLESNAKES ARE KILLED WITH WAR POISON GAS

Mustard gas has been employed by the Department of Agriculture to aid in the extermination of rattlesnakes in the state of Washington. The experiment consisted of forcing the gas into a bed of lava rock, which had hitherto proved to be an invulnerable retreat for the reptiles. Soon there appeared snakes of all sizes, dazed and blinded, in which condition they were quickly clubbed to death.

## STREET WIDENED TO RELIEVE CONGESTION IN CINCINNATI

Widening the intersection of Freeman and Western avenues with Liberty Street, in Cincinnati, Ohio, will relieve one of the most seriously congested spots in the city. Liberty Street is so narrow that it has been impossible for cars to turn north into Western Avenue while a car was turning south into Freeman Avenue. There was barely clearance for one car to turn at a time, and automobiles were compelled to wait until all cars had passed the corner. This corner is only three blocks from Redland Field, the home of the Cincinnati National League baseball team, and during the ball season especially the traffic is heavy. The city has purchased and torn down several buildings on the corner of Liberty Street and Freeman Avenue, which will be one of the broadest in the city when the work is completed. The change will greatly simplify traffic problems.

This Intersection Was So Narrow That One Street Car Turning the Corner Blocked All Other Traffic. Buildings have been Torn Down, and the Corner is being Widened. It will Be One of the Widest in the City

## DOUBLE KEYBOARD IN PIANO SIMPLIFIES THE FINGERING

By a rearrangement of the conventional piano keyboard several attempts have been made to make the fingering easier. One of the most recent is a double keyboard, the production of a Belgian inventor, which has attracted a great deal of attention among musicians, and which is said to be a decided improvement of the existing single keyboard. It simplifies the study of the piano, and at the same time makes possible a wider range of scale combinations and harmonics. The upper key is a half tone above the lower one. On the new keyboard the same fingering is used to play the major and minor scales. Modern piano compositions are easier to play, and the new keyboard permits the creation of many new effects and combinations that would be impossible on the conventional keyboard. The construction of the double keyboard is extremely simple, and it can be adapted to any type of piano, old or new, without necessitating interior changes of any kind.

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Double Keyboard, the Production of a Belgian Inventor, Which Facilitates the Study of the Piano, and Makes Possible the Playing of Effects and Combinations Impossible to Play on the Ordinary Single Keyboard

## NEW TYPE OF GOPHER TRAP MAKES RECORD CATCH

In farming districts where the eradication of gophers is necessary to profitable production of crops, a gopher trap which will catch 102 gophers in a single setting of 114 traps, should prove of great value. That is the record of a new type of trap, which seems to succeed where many previous inventions have failed. When a gopher finds light entering its run, it immediately plugs the hole by pushing dirt into it. This trap is set in such holes. The dirt passes over the trap, but, when the animal's nose touches the trigger, the jaws instantly close on its body.

**A Single Night's Catch of 102 Gophers, from a Set of 114 Traps: The New Gopher Trap, Which was Used, is Shown in the Insert**

## GERMAN MERCHANT MARINE SHOWS ENORMOUS GROWTH

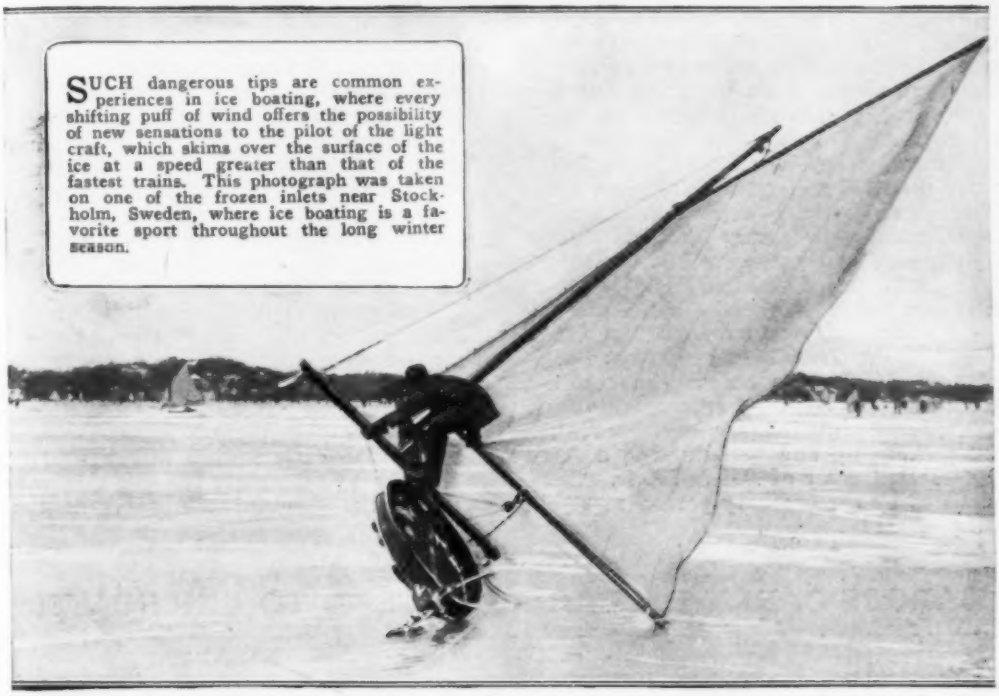
During the last half of 1921, the German merchant marine has shown a phenomenal growth. The present total is from 850,000 to 1,000,000 tons, an increase of about 250,000 tons since July. At present the German shipyards are intensely busy turning out additional vessels. This activity has been stimulated by the action of the government to withhold indemnities payable to shipping interests for vessels delivered to other countries, under the terms of the treaty of Versailles, unless new vessels are built to replace those lost. In spite of the increase in available tonnage, 80 per cent of Germany's foreign shipping is being carried in foreign bottoms. About three per cent is handled by American ships.

## INGENIOUS EMBLEMS SEEN AT FOOTBALL GAME

As usual, the rivalry between the universities of Indiana and Purdue called forth great enthusiasm at the annual football game, played at Bloomington, last fall. One of the features of the celebration was a prize contest for emblems displaying the spirit of the Indiana team and its coach, "Jumbo" Stiehm. Many novel ideas were represented, the favorite being a play on the name of the popular Indiana coach, in the form of an Indiana "Stiehm" roller. The preliminary enthusiasm was turned into a real celebration by a 3-to-0 victory for the Indiana team.

**Some of the Clever Emblems at the Indiana-Purdue Football Game, the Past Season, Took the Form of an Indiana "Stiehm" Roller**

## AN EXCITING MOMENT IN AN ICEBOAT

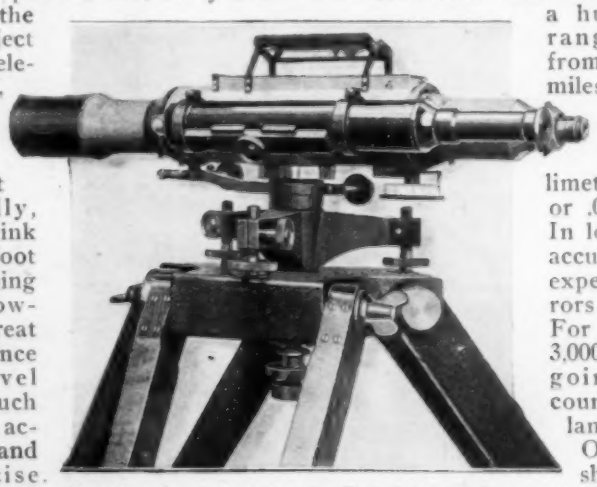


SUCH dangerous tips are common experiences in ice boating, where every shifting puff of wind offers the possibility of new sensations to the pilot of the light craft, which skims over the surface of the ice at a speed greater than that of the fastest trains. This photograph was taken on one of the frozen inlets near Stockholm, Sweden, where ice boating is a favorite sport throughout the long winter season.

## PRECISION LEVELING AND ITS PRACTICAL VALUE

By C. A. BRIGGS

IF a person stands where he can get a clear view of a point a mile away and tries to estimate the position of an object having the same elevation as himself, he will find, first, that it is hard to reach any conclusion at all, and secondly, that he cannot think of an error of a foot in a mile as meaning very much. However, it is of great practical importance to establish level lines to a very much greater degree of accuracy than this; and the most precise work is done by the United States Coast and Geodetic Survey, which prepares the most accurate maps obtainable, showing elevations, for all sections of the country.



Precision Level Used by the United States Coast and Geodetic Survey Which Is Remarkably Accurate

The precision-level lines established by this institution form a network of over a hundred circuits ranging in length from 100 to 4,700 miles. The average closing error of these circuits is less than .2 millimeter per kilometer, or .013 in. per mile. In long lines greater accuracy than this is expected, as the errors tend to cancel. For a distance of 3,000 miles, as in going across the country from the Atlantic to the Pacific Ocean, the error should be less than two feet, a proportionate error which would be negligible in any elevation survey made for practical application.

A person on the Pacific coast who

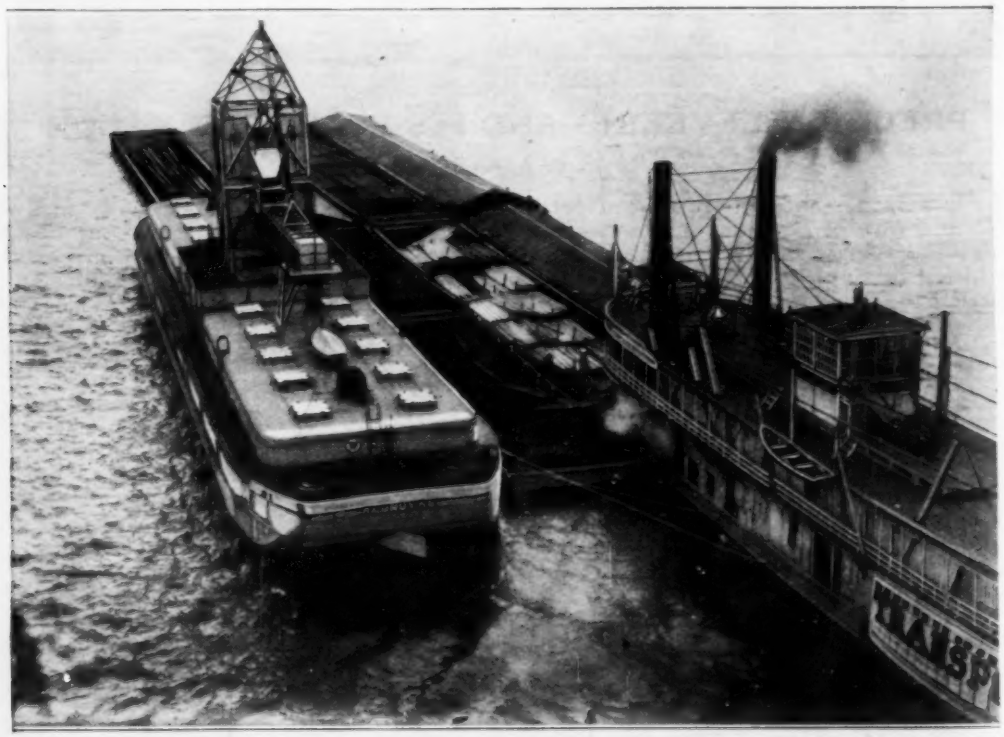
built a sea-level landing at a height established by running a line across the country and over the mountains from the Atlantic Ocean, instead of having his shoes at the water level might possibly find himself in water up to his waist or knees, but it is probable that his nose would be safely above water.

The longest sight that is taken is not more than 150 meters, which is just about 500 ft., or practically one-tenth of a mile. If it were unnecessary to take shorter sights, so that there were but ten to the mile, five forward and five back sights, an uncompensated error of .001 in. consistently made one way, on each sight, in observing at the 500-ft. range, would, in running 3,000 miles across the country, grow to be 30 in. Instruments and methods which will carry level lines without picking up and perpetuating a small uncorrected error of .001 in 500 ft. will be admitted by the ordinary person as something of a refinement.

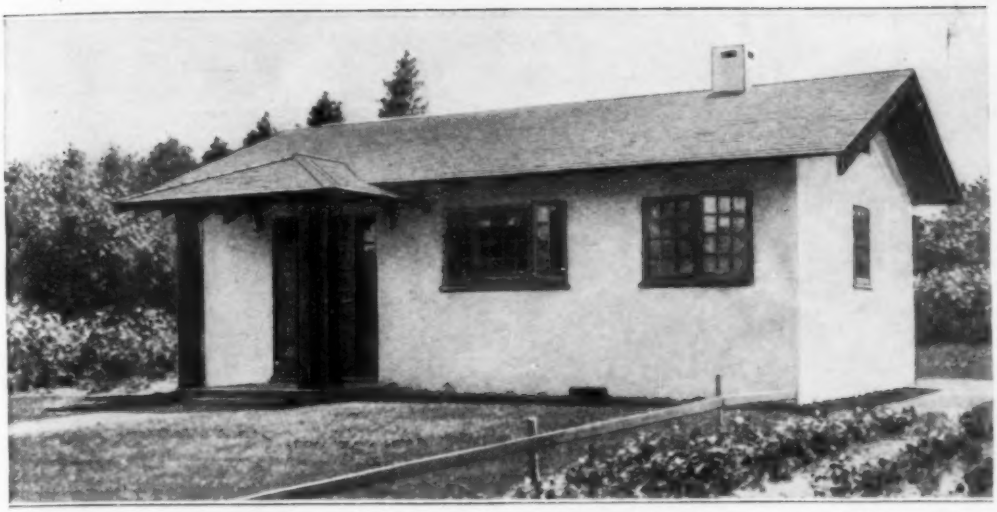
Accurate level lines are of vital importance when it comes to the drainage of swamps, where a fraction of a foot may determine whether or not a large area can be caused to drain by certain methods. It may determine whether the swamp can be drained into a river, or whether the river will drain into the swamp—rather important information to persons concerned in projects of the kind. Accurate level lines also determine the elevation of permanent marks which are of great value in mining, and for scientific and technical purposes. In the course of time they will tell what portions of the country are rising or sinking, and will give evidence of what the geological history of the future may be, as well as shed light on the past.

The precision network of level lines thrown over the United States by the Coast and Geodetic Survey, will eventually be filled in by secondary surveys that will establish the level of all points in the country.

## BARGES CARRY PITTSBURGH STEEL TO CINCINNATI



FOR the first time in many years a shipment of steel was recently made from Pittsburgh, via the Ohio River, to Cincinnati harbor. The steel was loaded on six barges which were towed by the steamboat "Transporter." From Cincinnati a large ocean-going craft, with a derrick towering 75 ft. above its deck, carries freight by river to the Gulf of Mexico, and across the Gulf to South America. This shipment will be followed by others, and it is expected that this will become a common method of transportation of products of the iron and steel district around Pittsburgh to points beyond Cincinnati, and also to St. Paul.



One-Room Bungalow, in Which the Owner Employed His Practical Experience as a Boat Builder to Utilize Every Inch of Space to the Best Advantage, without Sacrificing Attractiveness of Appearance

# ONE-ROOM HOUSE HAS ROOMS IN WALLS

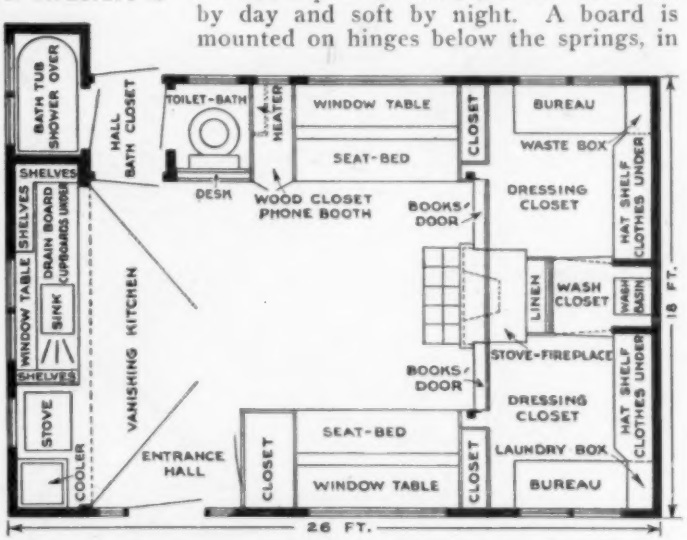
By FRANK B. HOWE

PATENTS have recently been granted on a most unusual miniature house, at Santa Barbara, Calif., which although it is in reality a one-room bungalow, has all the other rooms of an ordinary dwelling concealed in various places about it.

The basic plan of the queer structure is a central room, surrounded by double walls placed from 3 to 7 ft. apart. In these hollow walls are concealed a kitchen, a bathroom, dressing rooms, and other of the orthodox accompaniments of the usual modern home.

The entrances leading from the main central room into the various wall rooms have been concealed so that there is no indication of their existence. When he desires to go into one of them, the owner walks to an apparently blind wall, and, presto, it opens.

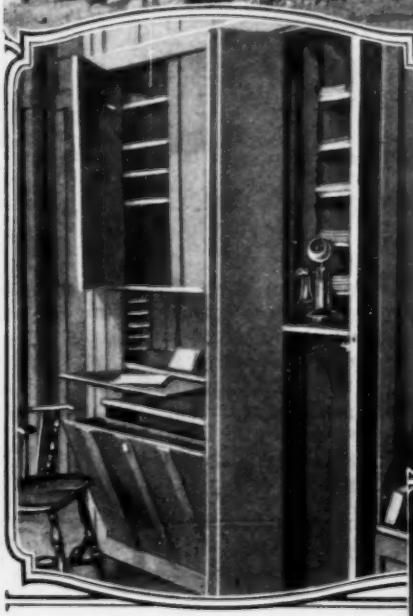
Starting at one end of the central room, the first side opens into a complete kitchen. The next side contains a bathroom, a bed, and several little accessories, such as a wood box, telephone closet, and desk. The third side contains two dressing closets, while the remaining wall accommodates another bed, and also the front entrance.



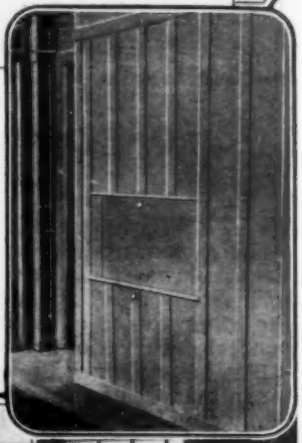

Floor Plan of This Unusual Bungalow, Showing the Ingenious Way in Which a Complete Home was Secured in a Space 18 Feet by 26 Feet, No Larger Than a Single Big Living Room in Many Houses

Special mention must be made of the built-in beds, which can be transformed into window seats. Realizing that a comfortable bed is too springy to be practicable as a seat, and that a comfortable seat is far too hard for a bed, the inventor has devised a plan to make the seat-bed hard by day and soft by night. A board is mounted on hinges below the springs, in such a way that it rises, describing an arc, at the pull of a rope. When the seat-bed is to be used as a seat, this board pulls up against the springs, preventing them from acting, and converting the bed into

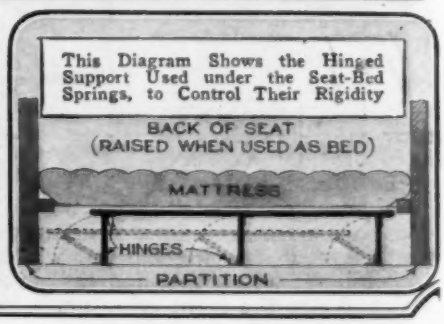
Rear View of the Bungalow: The Foundations were Kept Entirely below Ground to Avoid Giving the Appearance of a Box Sticking Up in the Air. The Effect of This Toylike House Is Artistic Throughout

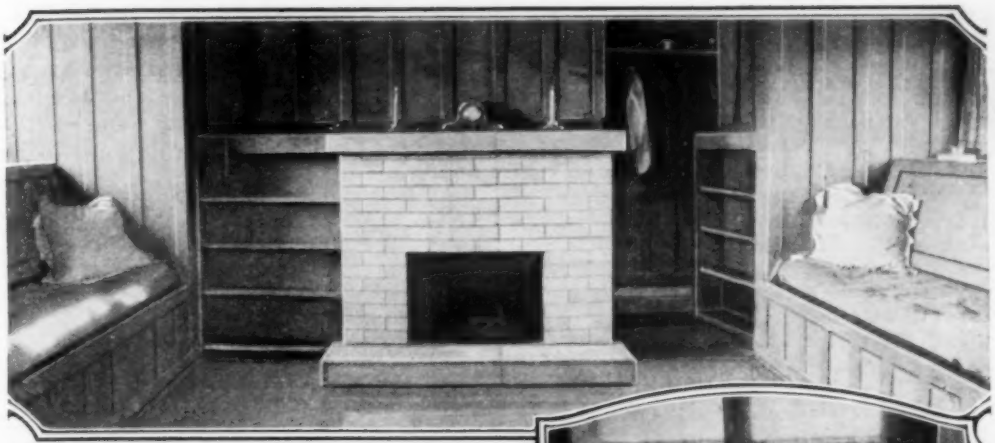


The Paneled Wall at the Right Looks No Different from Any Other Part of the Wall, but It Opens to Give Access to the Furnishings Seen at the Left. Here Are a Telephone Closet and a Desk, with Shelves above It and a Waste Basket Below. There Are Only Three Pieces of Detached Furniture in the House, a Table, Which Serves as a Living-Room and Dining-Room Table in One, and Two Chairs

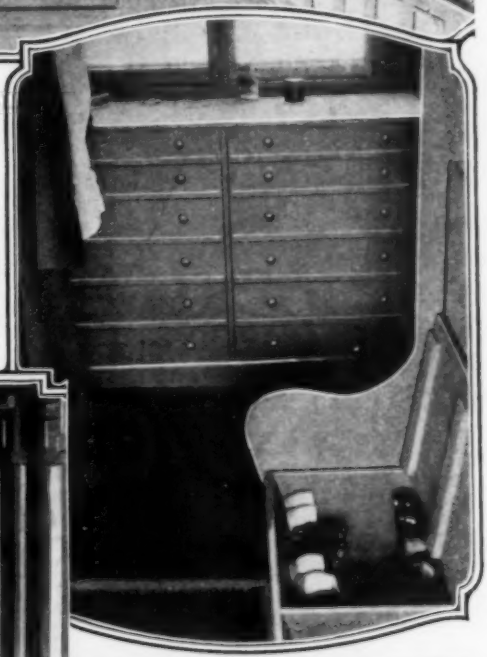


Under Each of the Two Large Windows Is a Comfortable Built-In Seat. At Night, These Seats can be Converted into Equally Comfortable Beds. An Entirely Original Device is Used So That the Springs can be Made More Rigid When Required as Seats, or Given That Additional Resiliency Needed for a Bed

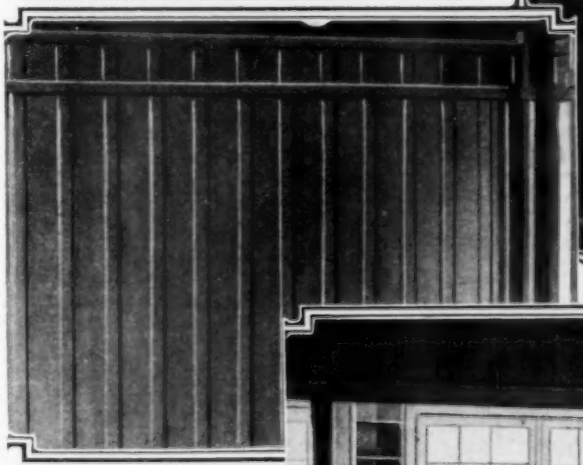

This Diagram Shows the Hinged Support Used under the Seat-Bed Springs, to Control Their Rigidity
BACK OF SEAT
(RAISED WHEN USED AS BED)
MATTRESS
HINGES
PARTITION

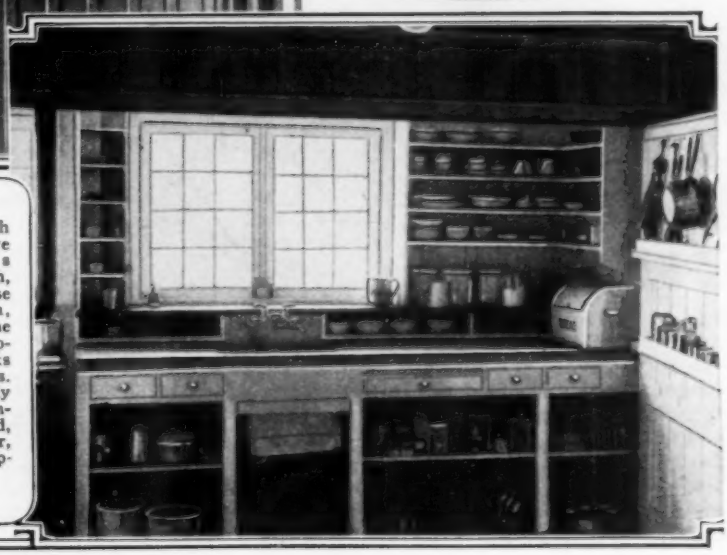


One End of the Room, Showing the Open Fireplace, the Window Seat-Beds, and the Bookcases, at Each Side of the Fireplace, Which Swing Open to Admit One to the Two Dressing Rooms: The Entrance to the Dressing Room at the Right Is Open



Interior of One of the Dressing Rooms: Each Contains a Hat Shelf, with Hooks Below for Hanging Clothes, a Closet, a Laundry Box, and a Complete Bureau, Built into the Wall. They are Well Lighted by Two Windows Directly over the Bureau





Another Wall, Above, Which Is Apparently Nothing More Than Plain Paneling, Is Really Two Doors, Which, When Swung Open, Disclose a Well-Equipped Kitchen, Shown at the Right. The Backs of the Doors are Supplied with Hooks and Racks for Holding Various Utensils. The Kitchen Itself Is Only Three Feet Deep, but Contains a Sink and Drainboard, a Full-Sized Stove, a Cooler, and Ample Shelf and Cupboard Space

a comfortable seat. When the device is to be used as a bed, this board is dropped down, the springs function as usual, and a soft bed is obtained.

With the exception of a table and two chairs, all furniture is built in, most of it being concealed here and there in the blind walls, and coming forth when desired. Everything is built clear down to the floor, to do away with sweeping under the furniture.

The net result of the strange home is that 10 minutes suffice to do the housework each day; yet the residents are fully as comfortable and have all the conveniences of persons living in much larger houses.

At first glance one might criticize the house as being poorly ventilated. Such, however, is not the case. Ventilation has been carefully planned and is ample, through a system of air currents. In fact everything considered necessary in a modern dwelling has been provided for.

## ASTONISHING PROGRESS MADE IN MOTORLESS FLIGHT

Restrictions in regard to airplane motors, placed upon Germany by the peace treaty, have resulted in extensive experiments in soaring flight with motorless planes. Weather conditions during the second annual soaring competition, held last summer in the Rhön district, were unfavorable, but some astonishing and important flights were made by airmen who remained there for further experiments. These flights have aroused great interest, and in France have stimulated similar activity. Flights by Klemperer, Martens, and Harth, of 13, 15, and 21 minutes' duration, respectively, are particularly noteworthy. Though Harth made the longest flight, 15 miles, Klemperer's six-mile flight offered a better opportunity to analyze soaring flight. Such an analysis seems to support the theory that soaring is accomplished by utilizing ascending air currents to attain or maintain altitude, and by gliding between points where such air currents exist. Klemperer flew between two points 2¾ miles apart, but, by turning and circling maneuvers, including a complete figure "8," covered about six miles. He attained an altitude fully 400 ft. higher than his starting point.

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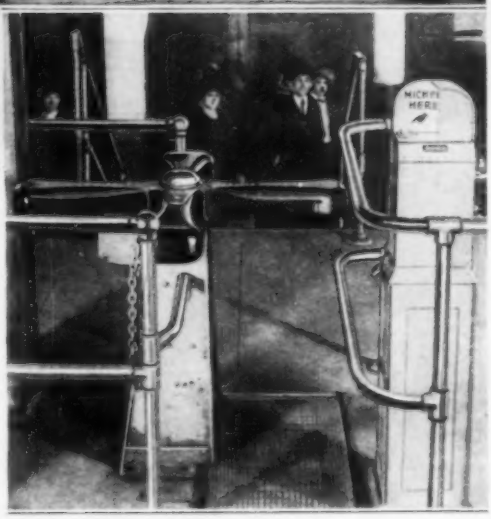
**One of the Motorless Airplanes Flying in the Rhön District: This Human Bird Caused Great Astonishment to the Peasants Engaged in Haymaking**

The method of launching the machines is of interest. It is done in the same manner as a boy throws a missile with a sling shot. The glider is placed on sloping ground, a rope is passed around its undercarriage, and to its ends are attached stout rubber cords, anchored on either side and in front of the machine. Three men pull the machine and the rope backward until the rubber parts are under high tension, when they let go of it, and the glider flies away as if thrown from a catapult. After the launching, the machine continues its flight, at first by the impetus received and then by manipulation of the movable wing. Experiments have shown that motors of only 3 to 5 hp. would suffice to overcome wind resistance, and thus enable suitably designed gliders to make very long flights. Further developments along this line are expected.

Left: Prospective Passenger Obtaining Change to Drop in the Automatic Turnstile. Right: Passenger Dropping Nickel in Slot to Operate Turnstile

## "NICKEL-FIRST" TURNSTILES FOR SUBWAY ENTRANCES

Turnstile admittance gates, with attendants watching them, are a common sight, but the spectacle of a gate of this kind operating automatically is a new feature. When a person wishes to pass through the gate, a nickel must first be dropped into a slot on the turnstile, and this coin allows one prospective passenger to enter. Passengers arriving at their destinations can use the gate as an exit, as it turns freely in the reverse direction. One of the subway systems of New York City is conducting experiments with this automatic gate, and if it is found practical, the entire system will be equipped with this type of entrance.



This Automatic Turnstile is Locked, but will Operate Readily If a Nickel is Dropped in the Slot. This Allows One Passenger to Enter

## SHAFTING STEEL TESTED TO FIND STRESS LIMIT

Tests have been conducted to determine the fatigue of metals, in which the general problem was to find out what relation exists between the static elastic strength of steel, and its ability to withstand millions of reversals of stress. In making these tests, a large number of identical pieces of steel were used. A piece was selected, loaded heavily to insure its breaking in a short time, and then rotated until it gave way. With successive pieces, the load was gradually reduced until one piece withstood 100,000,000 revolutions without breaking. The experiments showed that the number of revolutions required for a breakdown increases uniformly as the load is decreased, until a certain load is reached. A slight reduction from this particular load makes it impossible to break the piece, even when run up to 100,000,000 revolutions. These tests have been made under the supervision of the University of Illinois.

## CHIAPAS INDIANS POSE RELUCTANTLY TO CAMERA

Two Chiapas Indians and the White Men Who Persuaded Them, with Great Difficulty, to Pose for Their Photographs

In Chiapas, the most southern and probably the least developed state of Mexico, there are 14 distinct tribes of Indians. Each of these tribes has a language of its own, but they all have one characteristic in common. They do not mingle with the white people who live in that part of the country, and it is difficult to learn much about their life and habits. Cameras are mysterious and terrible to them, and it is seldom possible to persuade a native to have his picture taken. There is an unverified but persistent report, among the white inhabitants of Chiapas, that these Indians have some means of communicating across distances of many miles.

## POWER-DRIVEN CIRCULAR SAW FOR HARVESTING ICE

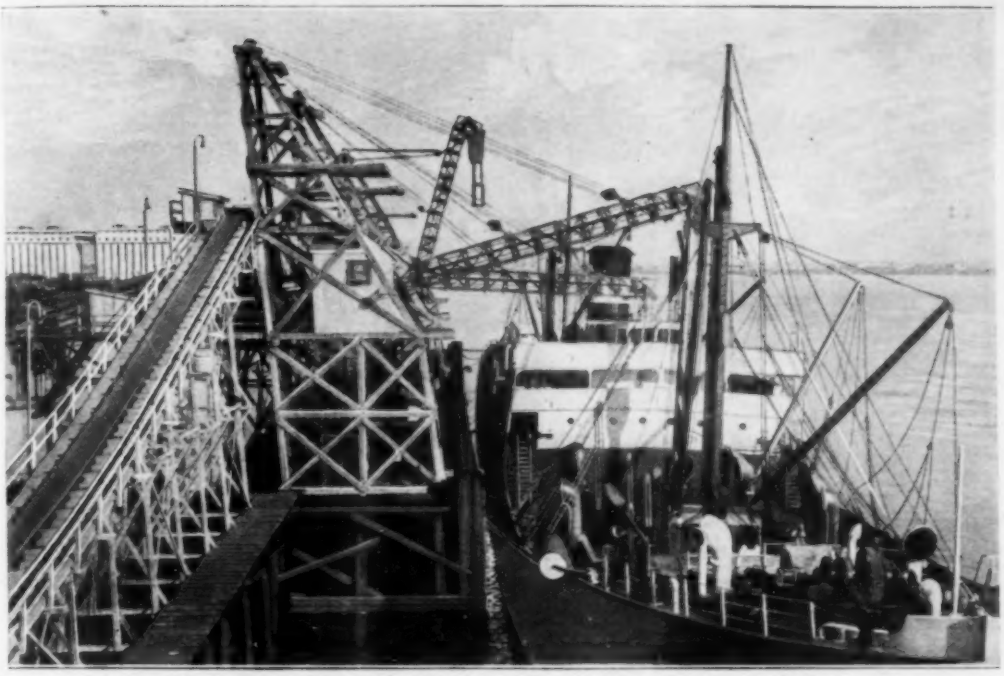
Power-Driven Circular Saw Mounted on a Bobsleigh for Harvesting Ice: The Man with the Pole beside the Sleigh Moves It Forward as the Saw Cuts Its Way through the Ice

On a lake in northern Michigan the ice is being cut with a power-driven circular saw mounted on a small bobsleigh. The saw overhangs the rear of the sleigh, and in front of it is a 5-hp. air-cooled gasoline engine with a chain-drive connection. After the saw is started, and has cut its way through the ice, the sleigh is impelled forward and guided by one man. As the saw cuts its own way, this requires only enough force to keep it up against the ice, and in this manner one man can with little exertion do as much work as several with the old crosscut handsaw.

## STEEPLEJACK CLIMBS CHIMNEY WITH AID OF BOX KITE

With the aid of an ordinary box kite, Thomas Fitzpatrick, better known in New England as "Steeple Tom," recently placed a harness on a 165-ft. brick chimney in Peace Dale, R. I., and raised himself to the top. It was the second chimney he had scaled in this way, and the highest he had ever climbed. By skillful maneuvering, he made the kite graze the top of the chimney and drop to the ground on the opposite side. Then, by the successive raising of cords and ropes of increasing strength, a hook line was run up, followed by a 1-in. rope and a block and tackle, strong enough to raise him to the top in a chair.

Flying a Box Kite over a 165-Foot Chimney Enabled "Steeple Tom" to Put Up His Climbing Tackle



Steamship "Emergency Aid" being Loaded with 550 Tons of Coke at the New Coal-Handling Plant at New Orleans, Louisiana, Operated by the Board of Commissioners of That Port

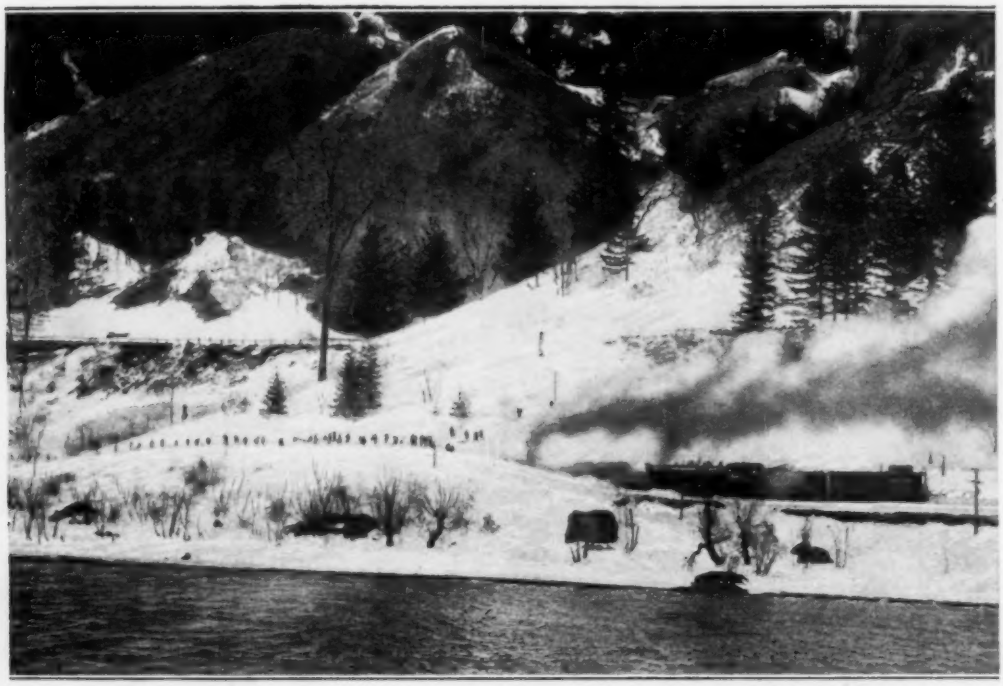
## NEW COAL-HANDLING PLANT AT NEW ORLEANS

There was recently put into service a new coal-handling plant at the port of New Orleans, La. The plant is for the purpose of unloading coal or coke from railroad cars, or barges, on the Mississippi River, and transferring it to steamships. The coal pile in the yard has a capacity of 25,000 tons, and to or from this a conveyor carries the coal to the boat and barge docks, where there are three loading towers, with a maximum capacity of 1,000 tons an hour, that can load three ships simultaneously, and one unloading tower for taking the coal from barges. Two of the loading towers travel along a track so that they can discharge directly into the ships' hatches, and the unloading tower at the barge dock is also of the traveling type.

## NEW SIGNAL GIVES WARNING OF ALL AUTO MOVEMENTS

Six distinct signals are provided by a new auto-traffic signal device. It consists of a front and a rear signal mounted on the fenders and equally visible by day or night. The front signal indicates to the traffic officer or pedestrian, by means of arrows, the intention to turn right, turn left, slow down or stop, and go forward or park. In the same way the rear signal warns the driver of any machine following. Stop and slow-down signals are operated automatically when the brake is applied. The other signals are operated by a toggle switch on the steering column. Attention is attracted to the signals by an automatically operated rear horn which can be cut out by means of a switch.

This All-Purpose Signal Shows the Officer That the Driver Intends to Turn to the Left



The Railroad, along the South Bank of the Columbia River, was Less Affected by the Snow Slides Than the Columbia River Highway, Which Runs Closer to the Mountainside, but in Places the Drifts Were 25 Feet Deep, and It Took a Week to Dig Out Seven Trains Which were Snowed In

# COLUMBIA RIVER HIGHWAY ICEBOUND

By H. E. THOMAS

SNOW and ice recently buried the lower Columbia River district in the worst storm that western Oregon and Washington have known in many years. It came on so suddenly that travelers were caught unawares. Automobiles and trains were snowbound, and the famous Columbia River highway was buried by a combination of drifts and slides.

On the edge of Portland, and east of that city for 20 miles, there was an "ice storm," known locally as a "silver thaw." Western Oregon has such storms about once in five years. The heavy rain froze as it fell until poles and wires were carried down in tangled masses, and trees broken and overturned. More than 11,000 telephones were put out of commission in Portland, and communication with other cities was cut off. Entire orchards in the storm zone were ruined.

In the Columbia River gorge there was a snowstorm of great severity. Tourists and pleasure drivers along the highway were forced to leave their cars to the elements and flee for safety. Some of them sought shelter in homes and hotels along the highway, while others caught the last train that was able to get through to Portland before the tie-up.

Parts of the highway are buried under slides as much as 30 ft. deep. Bridges were carried out and great masses of snow and ice came down the mountainside. At first, trucks and snowplows tried to clear the roadway, but found it an impossible task. The western end of the highway was cleared for some distance, but along the river the drifts and slides were so deep that it was concluded the job was not feasible, and that it would probably be necessary to wait until the spring thaw before parts of the highway could be opened.

More than 100 automobiles were stranded along the boulevard. Some of them were later rescued and taken away on trains and boats. Others, however, are completely buried under snow and ice, and are probably marooned for the winter.

Seven passenger trains were stalled on the railroads on the north and south banks of the Columbia. The passengers, after several days, were rescued on river boats sent out from Portland, and were none the worse for their experience. It was a week before the tracks could be cleared and the trains taken out. The railroad was not so seriously blocked as

Near Portland There Was No Snow, but an "Ice Storm" Left the Country as Shown Above, with Telephone Poles Down, Trees Broken, and Orchards Ruined. Where the Snow Fell, Drifts Almost Covered Telephone Poles, as Seen Below. This View Also Shows a Path from a Train, to Take the Passengers to a River Boat

the highway, because it is farther from the mountainside and was therefore less affected by the slides.

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¶Merchants of Foochow, China, have formed a $300,000 irrigation company and purchased American machinery for the project. About 500 acres of land will be irrigated at an annual cost of $36 an acre.

The Machine at the Left was Incrusted with Ice by Only a Few Hours' Exposure to the "Silver Thaw," One of the Ice Storms Which Occur Here About Every Five Years

## HEADLIGHT ON REAR OF CAR LATEST AUTO FEATURE

A headlight, beside the taillight and mounted with it, is a feature which is being supplied on one of the new-model automobiles. It serves the double purpose of warning persons and cars behind when the machine is backing up, and of lighting the road behind so that the driver can see where he is going, when backing. It is automatically switched on when the gears are thrown into reverse, and turned off when the reverse is disengaged.

## AUTOMATIC BLOWTORCH NEEDS NO AUXILIARY PRESSURE

A blowtorch that does not blow, in the sense that it does not depend upon air pressure pumped up in the usual way, but instead generates its own pressure, is being placed upon the market. On top of the torch can is the burner in the shape of a coil containing an asbestos wick from the burner orifice to the interior of the can. When this coil is heated it vaporizes the gasoline, or other volatile fuel, in the can, which ignites at the orifice. It is said that the heat of the burner generates the vapor more rapidly than it can issue from the orifice, and therefore pressure is established inside the can, and the power of the flame is increased.

## NEW YORK HOTEL COMPANY ADDS NOVEL EXTENSION

A novel extension of the Hotel Van Rensselaer, in New York City, is just being completed. The hotel stands on Eleventh Street near Fifth Avenue. On the corner of Fifth Avenue is an eleven-story apartment building and between the two there has been an old garage, covering a 25 by 100-ft. lot. In order to protect the hotel's light, the company decided to take over and improve this property by building a two-story seven-room house. This house, of distinctive Moorish architecture, is set back 50 ft. from the sidewalk with a picturesque formal garden, laid out with a flagstone walk and low brick walls in front of it. Tucked away between its tall neighbors, it is almost lost to the view of the casual passer-by.

## ELECTRIC CANDLE AND WREATH MINIMIZE FIRE RISK

The custom of using candles with the holly wreaths placed in windows at Christmas time has been growing more popular, especially since the war. A dry-holly wreath and a lighted candle present a very real danger of fire, but the custom has been made safe by electricity, just as the Christmas-tree custom was made safe by it. Wreaths are being made of cloth, sewed onto a metal ring. At the bottom of the ring is a round ball containing a standard candelabra socket, in which a flame-type bulb is used. An 8-ft. silk cord, connected at the bottom of the socket, supplies the current from one of the regular light fixtures.

## NAVAL AND MARINE AIR CRAFT MAKE EXTENSIVE FLIGHTS

The annual report of the Naval Board of Aeronautics for the last fiscal period states that a total distance of 2,511,000 miles has been covered by naval and marine air craft, in flights during the past year. It states that satisfactory long flights have been made by the squadrons attached to the fleets, and that a special type of "spotting" plane is being manufactured, after a contract competition between American manufacturers. Only passing reference is made to the bombing tests made upon warships, which were conducted last summer.

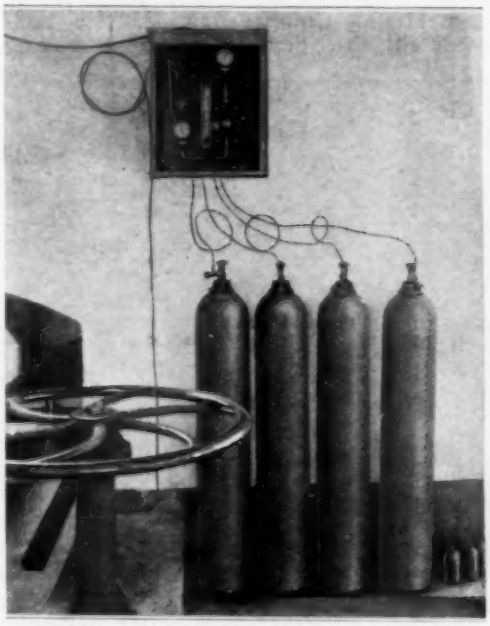
# "GASSING" BAD ODORS

By HARRY A. MOUNT

THE problem of getting rid of odors from garbage and sewage-disposal, fertilizer, and similar plants, which generally are a public nuisance unless located at isolated spots, has been somewhat simplified by the practical demonstration of the fact that minute quantities of chlorine gas will effectively kill the noxious odors, and by the construction of a compact apparatus for its application.

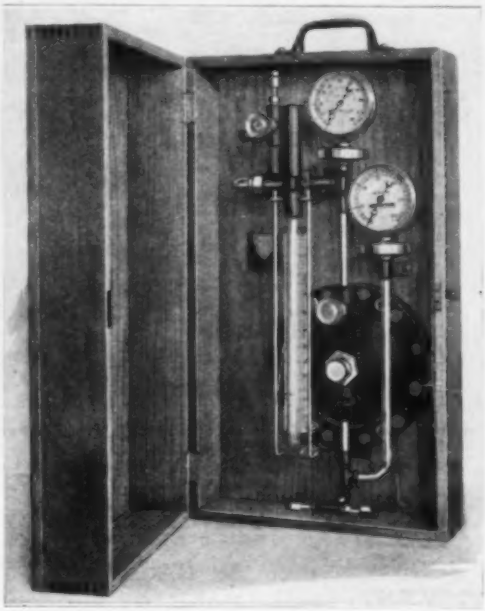
As tanks of chlorine gas, compressed to a liquid state, have largely replaced chloride of lime as a means of purifying water supplies, so these same tanks are utilized in "gassing" bad odors. The complete deodorizing plant consists of one or more tanks of liquid chlorine and apparatus for controlling automatically the flow of gas. This automatic control comprises a pressure compensator, which keeps the flow of liquid chlorine from the tanks constant in spite of varying pressure in the tank and temperature changes; pressure gauges to show tank pressure and back pressure in the gas line, and a meter to indicate the rate of flow.

The chlorine is allowed to vaporize into a gas in the control apparatus, and is then piped directly to a mixing chamber, where, by means of fans or otherwise, it is mixed with the odorous air. When the proportion of chlorine is correctly adjusted, the odor disappears at once and entirely.



A Chlorinator of the Type Commonly Used for Water Purification, but Modified for the Purpose of "Gassing" Bad Odors

Two severe tests have brought conviction that the process is practical. One of these took place at the Barren Island plant, where dead animals from New York City are cremated. The odors are carried off by means of a large stack. After it had been demonstrated that the odors from this stack, which are particularly offensive, could be completely overcome, a permanent installation of the sort described was made.



Portable Chlorinator, Showing Pressure Compensator, Pressure Gauges, and Meter for Measuring Chlorine Gas

The second test was made in getting rid of sewer gas in Cleveland. The city is planning a large sewage-disposal plant on the lake front, near the heart of the city, and was faced with the problem of getting rid of the sewer gas in an inoffensive manner. It was finally decided to build an enormous stack, 200 ft. high, to carry the gas to a height where it would not be a nuisance.

The efficiency of the chlorine process was tested in this case by introducing the gas into the sewer about 175 ft. from the point of discharge. It was found that only a white haze was left at the mouth of the sewer and this was entirely without odor. As a result of this test, the plans for the new plant have been modified, and a stack only 50 ft. high will be provided.

Laying Concrete-Block Paving along the Miami River at Dayton: The Ends of the Half-Inch Cables, Which Hold the Blocks in Place, can be Seen Projecting from the Last Row. Though the Cables Keep the Blocks from Sliding into the River, They Allow the Entire Mattress to Settle and Adjust Itself

# FLEXIBLE CONCRETE MATTRESS PROTECTS LEVEES

By IVAN E. HOUK

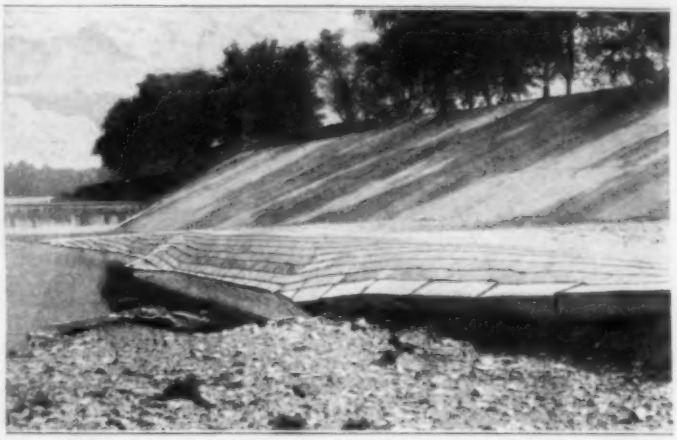
RECENT floods in the Great Miami River at Dayton, Ohio, have demonstrated beyond question the practicability of protecting levee slopes from erosion during periods of high water by flexible concrete-block paving. Owing to the comparatively crooked course of the river through the city, which throws the center of the current from side to side, the velocity of the water is unusually high along the banks on the outer edges of the bends during even moderate freshets. To protect the earth and gravel slopes from erosion at such times, the engineers of the Miami Conservancy District constructed the flexible concrete paving

The Blocks are Anchored to Concrete Slabs Laid on the Bank Just above Them. The Tops of Piles, Driven at the Lower Ends of These Slabs, are Imbedded in Them When They are Poured, as are Also the Upper Ends of the Cables Which Run through the Blocks

shown in the accompanying views. The concrete blocks which form the flexible paving are 5 in. thick, 12 in. wide, and 24 in. long. They were laid flat on the river bed and bank, breaking joints like brick in a wall, and were tied together by ½-in. galvanized-steel cables, run at right angles to the levee through holes in the blocks, thus weaving them into a continuous flexible mattress. There are no connections whatever between the blocks except the steel cables. Consequently the entire mattress, or any part of it, can sink down whenever it is undermined by the current.

The mattress is anchored in place by tying the steel cables into reinforced-concrete slabs laid higher up on the bank. The slabs are 6 in. thick, 8 ft. wide, and of variable length, depending on the length of the slope to be protected. They have footings at their lower ends, extending 18 in. into the ground. The slabs are held in place by timber piles, driven deep into the bed of the river beneath the footings before the slabs are cast. The upper ends of the slabs are left projecting above the ground, and the concrete to form the footings is poured around, so that the slabs are fastened rigidly to the piles.

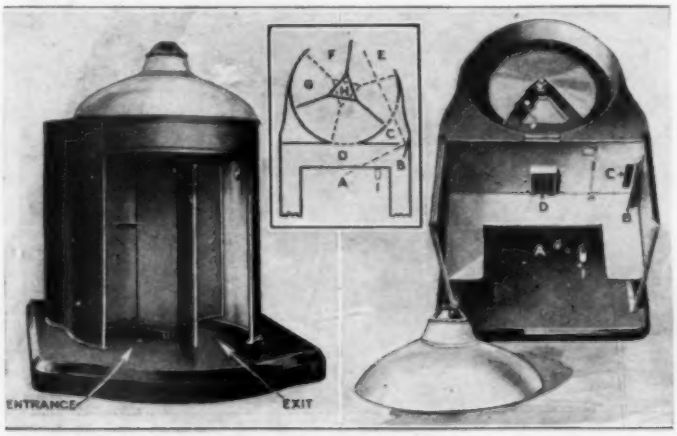
During flood times the concrete slabs and blocks protect the river bed and banks beneath them. At the river edge of the mattress, however, the swift current cuts away the earth and gravel, gradually undermining the concrete blocks. When this happens, the mattress simply settles down so as to cover the shore side of the hole, thus stopping the erosion.



When Floods Scour Out the River Bed under the Edge of the Block Mattress, It Settles into the Depression. After One or Two Floods, the Mattress becomes Adjusted So That No Further Erosion and Settling Occur

## BANDITS OUTWITTED BY SAFETY DOOR

Bandits have been outwitted by the use of a patented revolving door which operates similarly to the ordinary revolving door seen in large buildings, except that its turning can be controlled with a pedal. If placed in front of a paying teller's, or cashier's window, it insures privacy to any person receiving money, so that in the case of large withdrawals for pay-roll or other purposes, the amount cannot be seen by possible holdup men. By means of a properly placed mirror, the person entering the door can be seen by the cashier, before the window is reached. Thus if a suspicious-looking character enters the door with the apparent intent of holding up or shooting the custodian of the money, the simple release of the pedal would imprison the would-be thief until the arrival of the police.




Views and Diagram of Door: A Indicates Cashier's Place; B, Mirror; C, Window; D, Cashier's Window; E, Entrance; F, Exit; G, Space Where Bandit may be Locked In; H, Locking Device, and I, Control Pedal

## SIMPLE DIVING HELMET GIVES GOOD RESULTS

A diving helmet, which is not watertight but gives good results in water not more than 20 ft. deep, has been invented. It is made of cloth, fitting loosely over the head and shoulders and tied about the neck. It requires only a moment to adjust it, and it is kept inflated by means of a hand pump. The air compression excludes water in the same way that the air in a glass, thrust into water, open end down, excludes the water. A glass window permits clear vision under water. The diver sinks by means of weights carried in his hands, which he can drop, in case of a failure of the air supply, and rise to the surface without assistance.

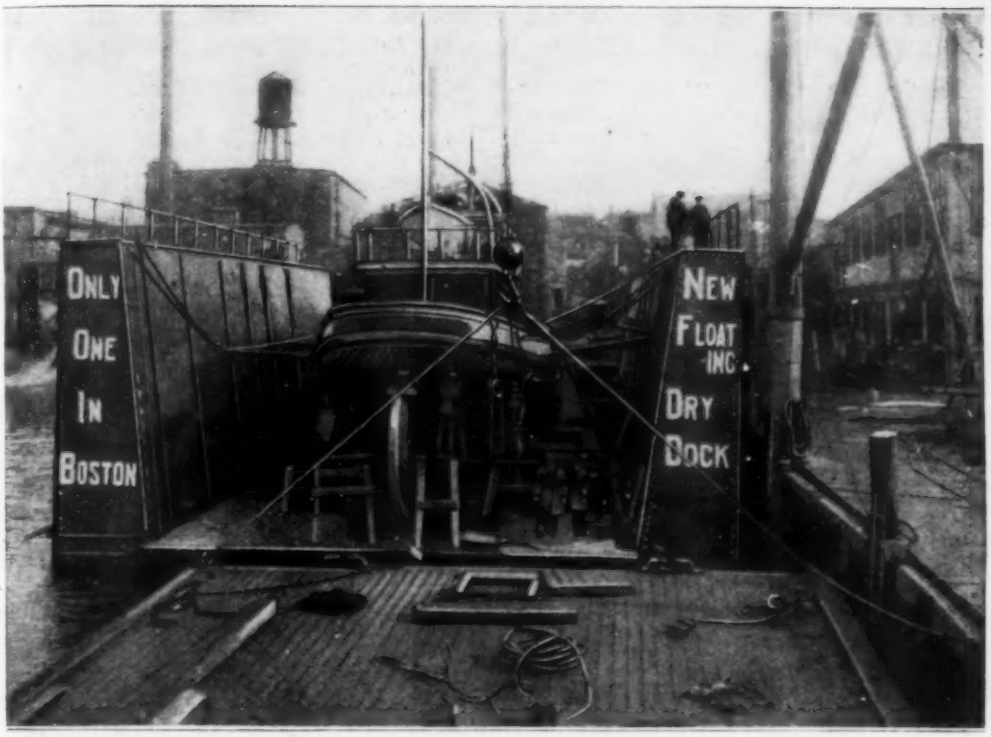
The Complete Diving Helmet and Air-Supply Pump Which Gives Satisfactory Results in Water of Any Depth Up to 20 Feet

## SAN FRANCISCO BAY CROSSED ON WATER-WALKING MACHINE

Walking on water has been reduced from the miraculous to the practical before now—once, for instance, with a pair of pontoon shoes—but never quite in the manner done recently by a California rancher, who with his device has actually walked across the bay from San Francisco to Oakland. The water-walking machine is in the form of two light metal pontoons, each about 9 ft. long, and 12 in. wide at the center, tapering to points at either end. These are suspended from a flat wooden frame, so constructed that when the operator stands, with his feet connected to the center of the pontoons, rollers between the frame and the pontoons permit him to move them back and forth by the act of walking. Hinged to the sides of the pontoons, and operated beneath them, are three self-feathering paddles, which give propulsion. There is also a rudder for steering.

FRAME FROM WHICH PONTOONS ARE SUSPENDED
ROLLERS PERMITTING PONTOONS TO SLIDE BACK AND FORTH
HINGES
HINGED PADDLES THAT FOLD ON FORWARD STROKE
ROLLERS PERMITTING PONTOONS TO SLIDE BACK AND FORTH

Machine for Walking on the Water Shown in Operation in the Inset, and in More Detail in the Enlarged View with Notations: The Propelling Paddles, Shown below the Hull, Are Self-Feathering. The Rudder at the Stern is Controlled by a Tiller in the Operator's Hands Which Also Affords Him Support, Enabling Him to Move His Legs Freely



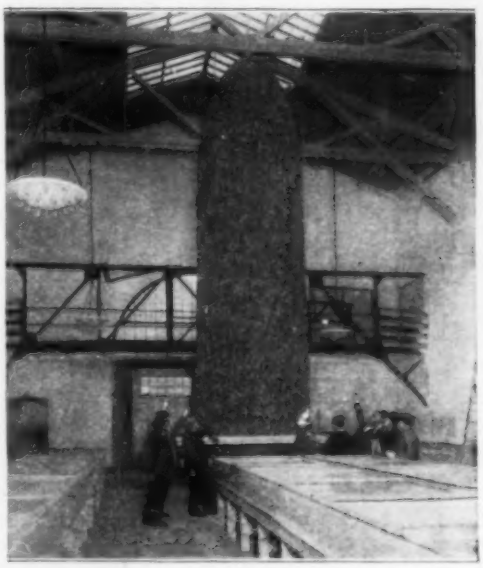

Floating a Tug on the New Steel Drydock Recently Built and Put into Operation at Boston, Massachusetts: This Dock Is the Only One of Its Kind in Boston and Probably the Smallest Floating Dock in the United States

## SMALLEST FLOATING DRYDOCK OF STEEL IS LAUNCHED

A floating steel drydock, said to be the smallest in the United States, was recently completed and put into operation at Boston, Mass. There are no other drydocks of the same type in that city and only a few in the entire country. It is 100 ft. long, 45 ft. wide, and its pontoons are 6 ft. deep. The nine water-tight compartments can be emptied in 20 minutes by three centrifugal pumps. It has a lifting capacity of 500 tons and was especially built, by the company operating it, for handling small tugs and trawlers.

## MONSTER EAR OF CORN THIRTY FEET HIGH

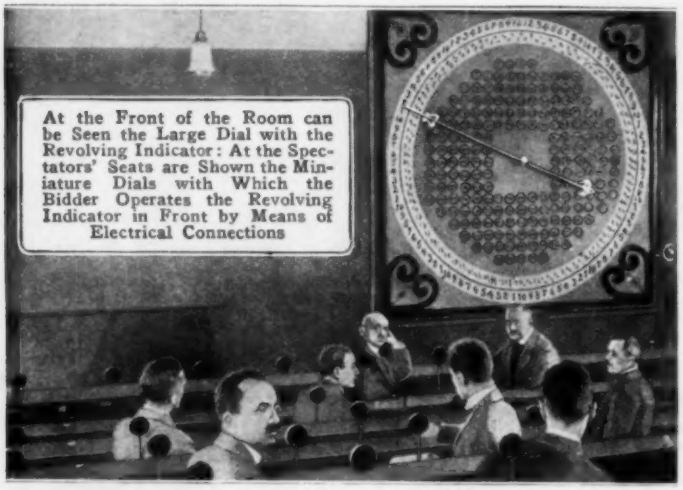
Among the exhibits at the International Grain and Hay Show, in Chicago, was a monster ear of corn, 30 ft. long. It was man-made, of course, but was such a close imitation that, at a little distance, there was nothing to distinguish it from a natural ear. Sixty bushels of corn were used to build it. The ears were split in half and attached to a central "cob." The corn used to build this exhibit would have been sufficient to fatten five hogs from 100 lb. to 220 lb. each.



Monster Ear of Corn, 30 Feet High, Exhibited at the International Grain and Hay Show, Which was Recently Held in Chicago

## "GOING-GOING-GONE" PHRASE IS OBSOLETE AT AUCTIONS

Auctioneering by electricity, which entirely eliminates the familiar loud-voiced methods formerly used, is carried on with the aid of lately developed apparatus. A large dial, with a revolving indicator, is divided into numerals representing money, and has the designations of all the seats in the auction room appearing on it. This large dial is elevated in full view of those present, and at the bidders' seats are placed miniature duplicates of the large dial. When a bidder wishes to make an offer, he turns the indicator of the small instrument before him to the amount offered. By means of electrical connections, the indicator of the large dial swings to the same number, and the designation of the bidder's seat is illuminated on its face. Thus the auctioneer, and others present, can tell without confusion, how much has been bid and the location of the bidder.



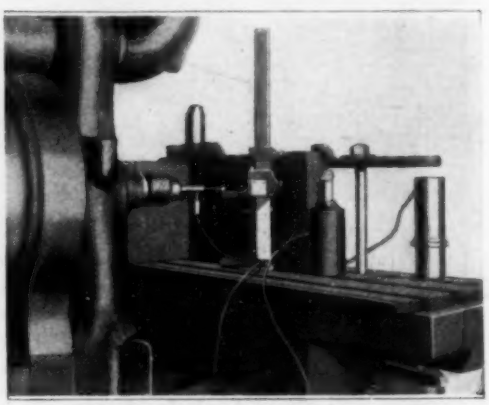
At the Front of the Room can be Seen the Large Dial with the Revolving Indicator: At the Spectators' Seats are Shown the Miniature Dials with Which the Bidder Operates the Revolving Indicator in Front by Means of Electrical Connections

## NEW 22,000,000,000-GALLON WATER RESERVOIR FOR NEW YORK

The water supply of New York City will be supplemented by the new Gilboa reservoir, being built on the headwaters of the Schoharie River, in the Catskill Mountains. It will cover 1,170 acres, be 5.8 miles long, from .3 to .7 miles wide, 57 ft. deep, and have a capacity of 22,000,000,000 gal. The water to maintain this great reservoir supply will come from a 314-square-mile watershed on which the average annual rainfall since 1907 has been 40 inches.

## ELECTRIC TRUING DEVICE AIDS MACHINISTS AND INSPECTORS

Machinists and inspectors can now true, or check up on, their work, very rapidly and efficiently by using an electrical locator recently brought out by a Lynn, Mass., concern. The instrument receives the current necessary for its operation from any light socket. It has a ball pointer, which can be placed in an ordinary chuck, and also a small steel lamp base holding an electric-light bulb. For operation, a plug and cord are attached to a light socket, one of the cord wires being connected to the ball pointer, while the other is connected to the lamp in the steel base. This base is placed on the bed of the machine, and the current flows from the base to the work. When anything with a round surface is tested, the object is rotated in a lathe, and then the ball pointer is set so as to make contact with the turning piece of work. If the surface of the work is true, there will be a constant flow of current from the ball pointer to the revolving surface, thus causing the lamp on the instrument to burn steadily. If the work is not accurate, the low or uneven places will not come in contact with the pointer, and the electrical circuit from the socket to the lamp will be broken. The lamp will then flicker on and off as the contact is broken.



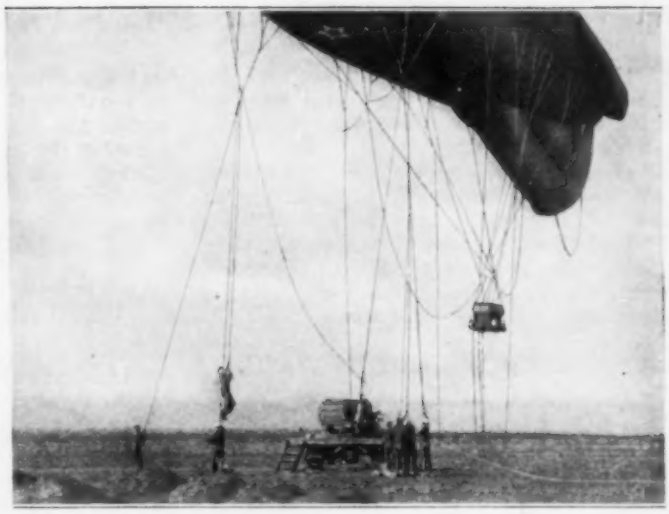
In the Chuck at the Left is Shown the Ball Pointer Which Rests on the Work being Tested. The Indicating Lamp is Seen in the Center

# TEACHING BALLOON CONTROL TO OBSERVERS

By FRANK B. HOWE

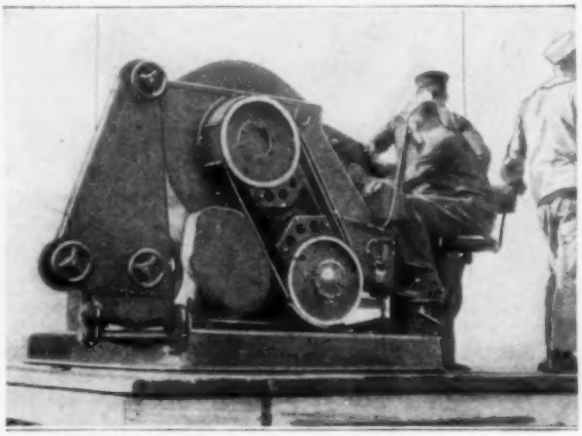
GREAT progress and many interesting developments are being made at the Naval Air Station, San Diego, Calif., in the training of balloon observers.

In the first place, a mechanism has been devised, somewhat on the order of the army trucks, which is equipped with balloon-handling apparatus. This enables the novices to practice balloon control without the usual attendant danger.

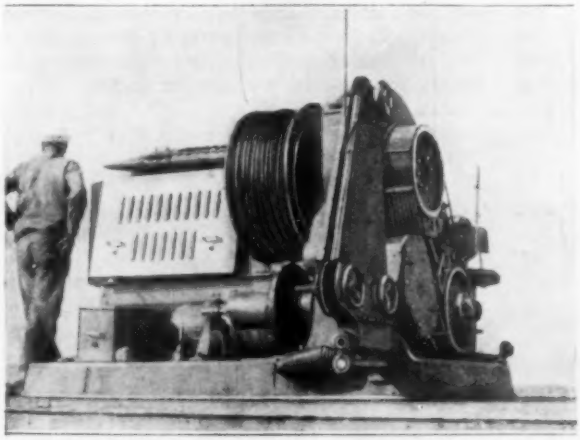


The Balloon Pulled Down within 30 Feet of the Ground, While the Students Practice the Difficult Task of Climbing up and down the Rope Ladder

An old automobile engine was mounted on a stationary platform in the middle of the field and made to operate the drum carrying the cable that holds the kite balloon used in this work. Here the sailors who are learning to manage balloons can practice to their heart's content without taking any chance of damaging the expensive balloon. The engine, which is kept running, is thrown in and out of gear with the drum at will, and two dials indicate the length of cable that has been let out. With this mechanism, they let the balloon out and haul it in until they are thoroughly familiar with its handling.



The Old Automobile Engine, Mounted upon a Platform for the Purpose of Operating the Winding Drum for the Cable That Holds the Balloon in Leash



This Is Another View of the Automobile Engine and Cable-Drum Apparatus Which is Used in Controlling the Raising and Lowering of the Practice Balloon

To avoid having to pull the balloon clear to the ground each time some one wants to get in or out of the basket, a rope ladder, about 20 ft. long, is suspended below it. Hauling the balloon down with the auto engine until the rope ladder just comes within reach, the sailors practice running up and down the ladder until they become proficient enough to be able to do it under actual flying conditions.

Observation can also be studied under actual conditions by this method of rapid handling of the balloon. It is a simple matter to take up a number of the students, leave the big balloon at any given height, and let them

practice in making observations and determining distances, ranges, and weather conditions, all of which are of vital importance in warfare.

By the use of the stationary balloon-controlling apparatus, it is possible to give the students practical experience, instead of theory alone. As a result, they will be thoroughly familiar with the work, should they be called upon for duty in a future war.

## CRANE ANCHORED IN WALL OF BUILDING

When a company in Dayton, Ohio, decided to erect a 13-story addition to their present building, they discovered that there was no ground on which to set their hoisting crane. All the surrounding property was occupied, and, the site being in the center of the city, use of the street was out of the question. However, the addition is going right up. The crane for hoisting the heavy steel girders and other material was anchored in the wall of the building to which the new structure is to be an addition.

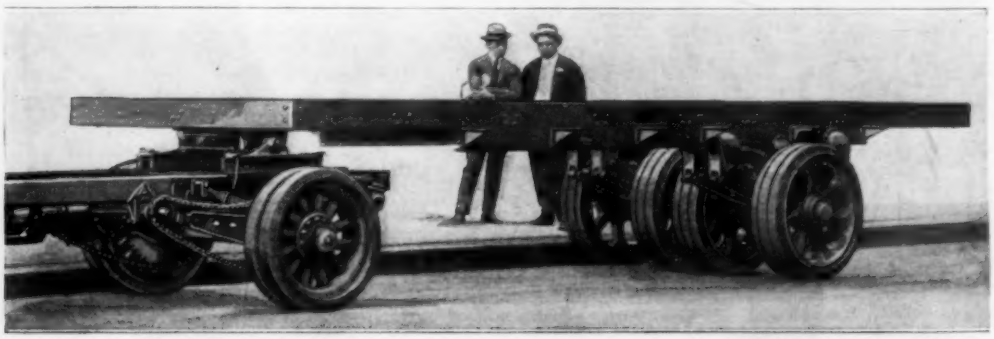
The Crane, Extending above the Tall Building, is Anchored to Its Wall. The Anchor can be Seen About Three Stories below the Roof

## POROUS-CONCRETE CASINGS USED AS WELL STRAINERS

Casings of porous concrete for well strainers are being used with satisfactory results in place of the usual brass strainer and steel casing. The porosity of the concrete is obtained by using a mix of one part cement to four of gravel, without sand, and with the gravel suitably screened. A casing of 36-in. internal diameter is made in 48-in. lengths, which are reinforced with ¼-in. steel rings and 1¼-in. vertical pipes. These are sunk by means of a steel casing with a cutting edge, which is removed when the concrete casing is in place. The concrete shell permits a flow of about 10 gal. of water a minute, and does not become choked with sand as readily as the ordinary brass strainer.

## TRAILER FOR HEAVY LOADS HAS FOUR WHEELS ON ONE AXLE

A trailer with four wheels on one axle, for the transportation of extremely heavy loads, has been built for a large steel concern. Between each pair of wheels a separate set of springs is provided. In this way a bump on one side only is absorbed without bouncing the load to an extent which would injure either the load or the trailer. This trailer is attached to the truck on its own turning pivot, and a set of heavy coil springs takes up any shock from sudden starts or stops.



Exceptional Strains Caused by the Extremely Heavy Loads Carried on This Trailer are Met by the Novel Arrangement of the Wheels and Heavy Springs. The Rear Springs can be Seen Placed between the Two Sets of Wheels. Those Taking Up Starting and Stopping Strains Are in the Turntable

# ARGENTINE INDIANS CROWDED OUT OF OLD HAUNTS

Mataco Indians, Members of a Warlike but Intelligent Tribe of the Argentine Chaco Family: Upper Left, Men, Who Have Two Languages; Below, Women, Who are Allowed to Learn Only One; Right, One of the Mataco Chiefs Who Act as "Labor Leaders" on the Plantations. One Chief Led His Indians Off to the Forest When Refused a Wage Increase

As the great quebracho forests of northern Argentina are being cut away to satisfy the ever-increasing demands of the United States and Europe for quebracho tanning extract, the fierce tribes of natives that held out against Spanish rule for three centuries are losing their old hunting grounds, and are sullenly taking their places in the sugar and cotton fields of the white settler.

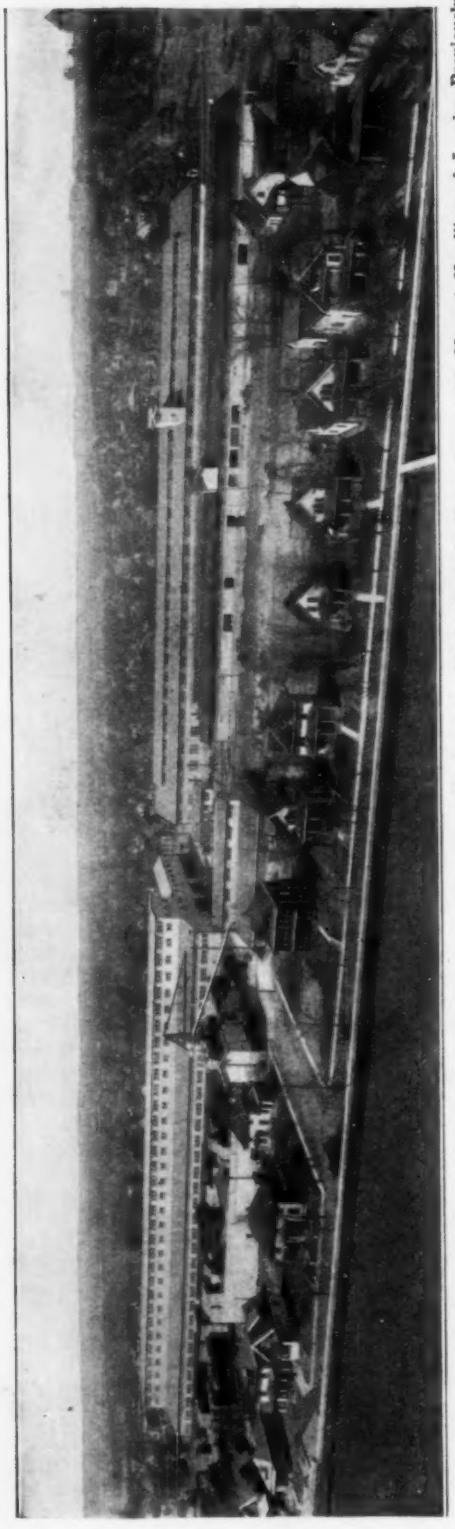
During the three centuries after the conquest of Peru, the Spanish missionaries penetrated all parts of South America, but were never able to gain headway among the wild tribes of what is known as the Gran Chaco of northern Argentina and western Paraguay. This vast country is flat and densely covered with forest, and many tribes still roam over it in primitive state. These tribes, belonging to what is known as the Chaco-Guaycuru family of Indians, were described by the early Spaniards as ferocious and irreconcilable, with an intense hatred of the white man. They were restless nomads who lived by hunting and fishing. Only within the last 20 years have they allowed the white man to advance his settlements, and then only because of fear of the Argentine army. They are now almost resigned to their fate, and they come to the settlements in large numbers to work in the cotton fields or in the sugar mills.

One sugar plantation and mill employs over 2,000 of these Indians at present. They still keep to themselves and persist in their own customs. They live apart in "toldos," or reed huts, dye and tattoo their skins, and adhere to their ancient ceremonies. They have formed a great liking for the American moving pictures, however. At the plantation, owned by an English company, a moving-picture show is provided at the Indian village every Saturday night, and although they understand neither English nor Spanish, the Indians squat on the ground and follow the actors with many grunts in their guttural language. The American cowboy actors are their favorites.

## NEW PROCESS TO USE RUBBER AS PAPER-MAKING MATERIAL

Rubber will be used in paper making by a recently patented process, which is the result of many years' experiments. Rubber latex, or milk, as it comes from the tree, is mixed with the paper pulp. Many kinds of paper are benefited in this way. The proportion of rubber varies, up to 20 per cent, for different papers.

# YARD HANDLES LUMBER WITH ELECTRIC MACHINERY



General View of the Minneapolis Lumber Yard Where Electrically Operated Machinery has Almost Entirely Done Away with Manual Handling of Lumber Previously Used: The Method in Operation Here was Worked Out as the Only Practical Means of Reducing Costs in the Lumber Business

IN a large lumber yard at Minneapolis, Minn., practically all the handling of lumber is done in large units by electrically operated machinery. Realizing that the cost of lumber production is thoroughly standardized, this company decided that the only point at which a saving could be effected was in the handling of the lumber in the retail yard. The method, based on large-scale machine handling and systematic routing, is the result of that decision, and it has proved highly successful in every detail of practical operation.

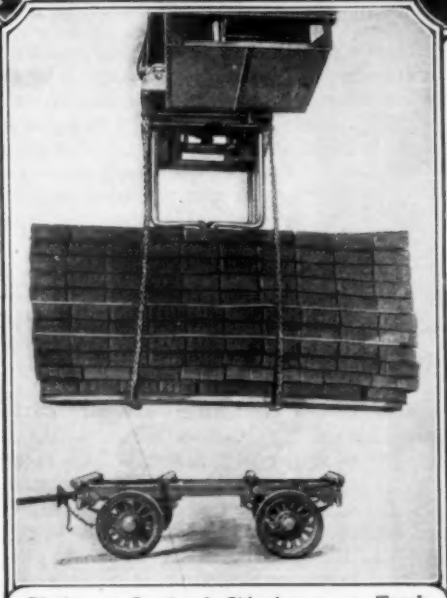
Incoming cars of lumber are made into trains each morning at the railroad yard, hauled to the company's plant and placed on sidetracks, alongside the building used to store the particular type of material which they contain. An electric overhead crane lifts the lumber from the cars in large "bites," and piles it in the storage sheds. In this way a car can be unloaded in 30 minutes, while formerly it took two men an entire day to unload a car by hand. This is typical of the efficiency with which every operation in the yard is now performed, in contrast with the old method.

When an order comes to the yard, it is turned over to the yard foreman. Under his direction it is picked up from the piles in large units by the electric cranes, which deposit it on trucks or trailers waiting at the ends of the storage sheds. The piles are so arranged in the sheds as to facilitate the rapid filling of orders, and only a few minutes are required for the loading of each truck. When it is necessary to deliver a load to another part of the yard, the crane places it upon a small trailer, or "lumber buggy." This is pulled by a small electric tractor to the point where it is needed. The whole process of transfer requires only a few minutes for completion.

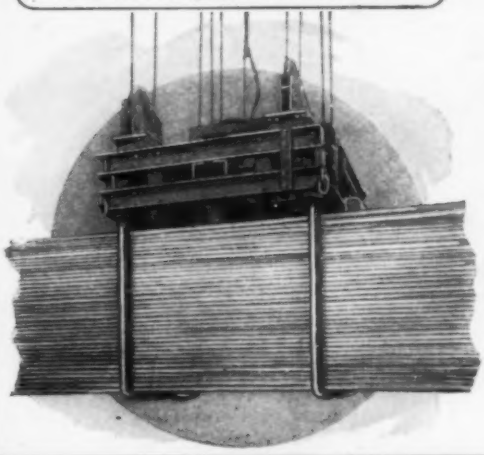
Heavy timbers, which are piled outdoors, are handled in the same way as other lumber. A special crane, on a track running the full length of the yard, is used for handling this type of material, and the timbers are piled in jagged piles so that they may be picked up easily, in units, by the crane.

The yard is planned in such a way that it is almost completely self-contained, and no outside help is required in any of its operations. A sawmill is so located that the cranes can carry lumber from the piles of stock to the saws. For orders needing special preparation, a planing mill is also provided which is supplied in the same way, by the cranes. In addition

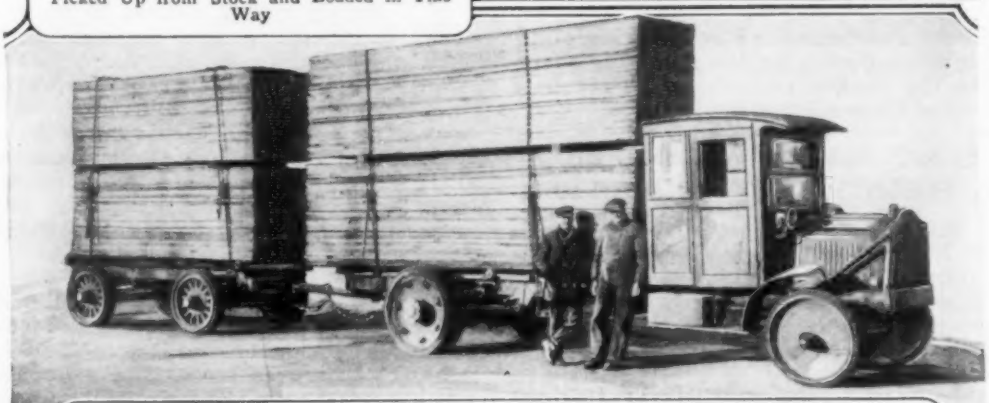
Main Lumber-Storage Shed, Showing the Crane Which Picks Lumber from the Cars and Piles It inside the Shed: The Crane Is About to Deposit One of Its "Bites"



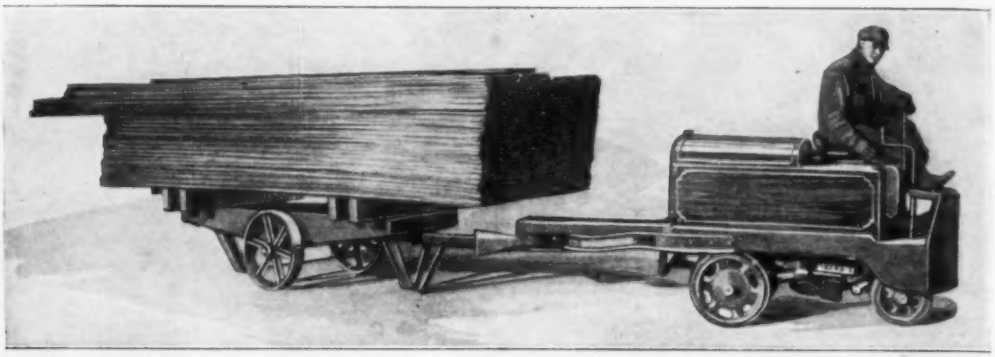
Placing a Load of Shingles on a Truck Trailer for Delivery: A Whole Load is Picked Up from Stock and Loaded in This Way



One of the "Bites" of Lumber Picked from the Flat Cars by the Electric Overhead Crane Which is Used for Unloading: This Method Effects a Great Saving in Labor and Time



A Truck and Trailer Loaded by the Electric Crane and Ready for Delivery within a Few Minutes After the Order had been Turned Over to the Yard Foreman: Here Again the Saving in Time Greatly Reduces the Total Cost of Handling Lumber in This Yard



One of the Small Trailers or "Lumber Buggies," Which are Used When It Is Necessary to Transfer Lumber from One Part of the Yard to Another: The Tractors Which Pull These Trailers are Electrically Operated

to these, the yard contains a horse barn and a garage where 24 trucks are housed. The garage includes a shop for repairing

The Outside Crane, Used in Moving Heavier Lumber Which can be Stored Outdoors: The Crane Is Just About to Place Its Load upon the Delivery Truck

trucks and tools, for blacksmithing, building truck bodies, painting, and for charging the electric tractors which are used within the yard.

## FIRST FLIGHT WITH HELIUM-INFLATED NAVY DIRIGIBLE

The United States naval dirigible "C-7," the first balloon ever inflated with helium gas, made its trial flight, from Hampton Roads, Va., to Washington, D. C., and return, early in December. This test of the noninflammable gas proved satisfactory in every particular. The most notable features of the test were that there was no dispersion of gas through the balloon fabric, perfect inflation being maintained during the entire trip, and that no "valving," or release of gas, was necessary in maneuvering. The United States has the only known sources of helium in the world of sufficient magnitude to permit its use for balloon inflation, which would give this country a tremendous advantage in the air, in case of any future war. Helium is obtained from natural-gas wells.

## NEW PROCESS RECOVERS SILVER FROM FIXING BATHS

Fixing baths used in photography contain more or less of the silver emulsion with which the plate or film is treated to make it light-sensitive. While the amount of silver is too small for the amateur to recover profitably, those doing this class of work on a large scale, find it worth while to regain this necessity. A scientist has recommended a compound called sodium hydrosulphite, which precipitates metallic silver from the solution in the fixing bath. After the bath has been treated with sufficient of this compound, it is thereby revived, and can be used again. This compound has industrial application along several lines, considerable amounts being used in reducing indigo in the ordinary methods of dyeing with this color.

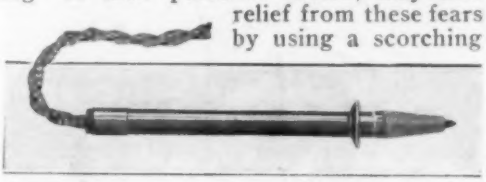
¶ For the first time wireless-telephone messages have been sent from a balloon, at McCook Field, Dayton, Ohio. Though messages have been received by balloons, sending was considered impossible because of the danger of sparks igniting the gas. Lieut. Philip Schneebarger successfully kept in touch with the ground for 25 miles.

## RADIO SERVICE BROADCAST OVER ENTIRE COUNTRY

Great success and widespread interest has been the outcome of pioneering in radio-telephone broadcasting, and a plan is contemplated whereby the entire United States will be covered with a service to the home, that will allow anyone to enjoy the many benefits of wireless. The service started with the transmission of the presidential election returns in November, 1920, and now includes the sending of musical recitals, grand opera, church services, speeches of prominent men, results of sporting events, government and stock-market reports, and national or international news of all kinds. Even "bedtime stories" have been sent out for children. It is predicted that this undertaking will prove to be of such expanding value to mankind, that the radiophone will soon be as popular in the home as the phonograph is today.

## FORGERY CAN BE PREVENTED BY USE OF SCORCHING PEN

Those who fear forgery, or the "raising" of their personal checks, may find relief from these fears by using a scorching



When the Cord of This Pen is Attached to an Electric-Light Socket the Point Becomes Hot Enough in 30 Seconds to Scorch Paper

pen when filling out checks. The pen is an electrical instrument, operating on the same principle as the familiar electric curling irons, and similar appliances, with cord attachment for sockets. A heating element inside the barrel of the pen, makes the point hot enough to scorch paper, leather, wood, cloth, and like materials. Thus, besides safeguarding checks by making letters and figures which cannot be removed, the pen can also be used for pyrographic work on wood or leather.

## WREATH INCASED IN ICE SENT FROM ANTIPODES TO ENGLAND

The anniversary of the battle of Trafalgar, known in England as Trafalgar Day, is always celebrated by the decoration with flowers and wreaths of the great monument in Trafalgar Square, London, which was erected in honor of Admiral Nelson, who commanded the British fleet at the notable victory. Last year a wreath was sent all the way from New Zealand preserved in the center of a block of ice weighing 600 lb. It reached the monument in good condition, and in time to take its place among the other decorations.

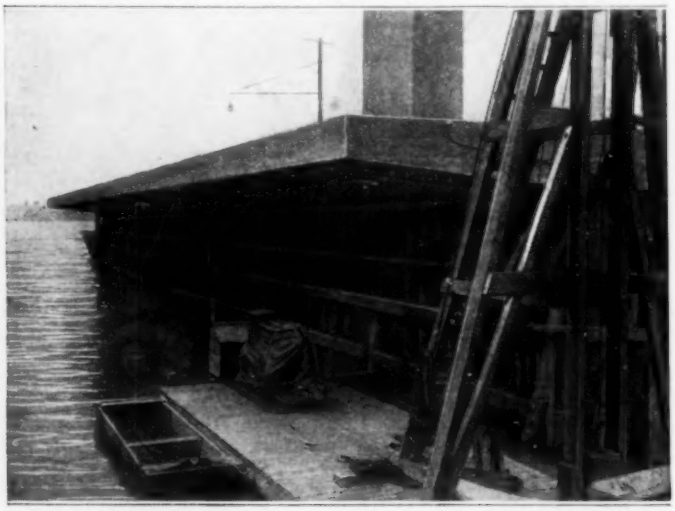
Among the Decorations Placed upon Nelson's Monument, in London, England, Last Year, in Celebration of the Anniversary of the Battle of Trafalgar, Was a Wreath Preserved in a Block of Ice Sent from New Zealand

## SARDINIA ARTIFICIAL LAKES AMONG LARGEST IN WORLD

Sardinia, one of the island possessions of Italy, will soon have artificial lakes ranking among the largest in the world. These lakes are being constructed for irrigation and hydroelectric-power purposes. At the present time, the mining industry of this island forms more than a quarter of the entire Italian output. Zinc alone is produced in the amount of 200,000 tons yearly, but has to be transported to other countries for manufacture. With the hydroelectric power soon to be available, it is expected that, instead of the zinc being exported and then imported in the finished state, this and various other mining products can be manufactured at home.

## NEW TYPE OF DOCK BUILT FOR LOADING BARGES

A new idea in dock construction has been employed by the city of Detroit, Mich., to facilitate the loading of barges. Dirt, used in the reclamation project by which 200 acres are being added to Belle Isle, is dumped into the barges at this dock. It is built on heavily reinforced piling and the edge projects 20 ft. over the water. Because of this projection half the barge is under the dock, and motor trucks can dump their loads of dirt directly into the center of the barge. The city charges 30 cents a cubic yard for the dumping privilege, collecting revenue at the rate of $100,000 a year, while securing dirt for its own work free.



Detroit's New Barge Dock, with a 20-Foot Projection over the Water, Is a Great Aid to the Rapid Loading of Barges

## CHEAPER LIQUIDS TO REPLACE MERCURY FOR THERMOMETERS

A discovery by Dr. Guido Moeller, a German scientist, may replace expensive mercury thermometers with a cheaper substitute, in places where accuracy within 1 or 2° is sufficient. Previous experiments in this field have failed because suitable liquids were colorless, and dyes did not darken them sufficiently, or would partly decompose at temperatures approaching 400° F. Doctor Moeller has found that three commercial chemicals—cumol, methylbenzoate, and amylbenzoate—can be relied upon for temperatures up to 300°, 400°, and 500° F., respectively. They can be dyed a dark brown with about one per cent of Syrian asphalt.

## WINTER STREET-REPAIR WORK DONE WITH OLD ASPHALT

Old asphalt is employed for street repairs during the winter months by a method developed at Cincinnati, Ohio. It is broken to about 2½-in. size and heated, with 4 or 5 gal. of water, in 100-gal. tanks, about half full. After steaming for half an hour, the asphalt is turned over and allowed to steam again. This is repeated for three hours, when the water has evaporated, and the asphalt is ready for use at 325 to 375° F. It is hauled to the street in another kettle, over a hot fire, and is laid exactly like new asphalt except that it is tamped instead of rolled. No additional bitumen or dust filler is used, and the cost for repairing is slightly less than it would be if the repairs were made with new material.

## MOVIE-STAR ATHLETE DEFEATS HORSE IN FOOT RACE

George Walsh, the well-known athlete and moving-picture star, has achieved new distinction by outrunning a race horse.

The Finish of a Novel Race: George Walsh is Shown Here Beating a Race Horse at the Aqueduct Race Track, Long Island, New York

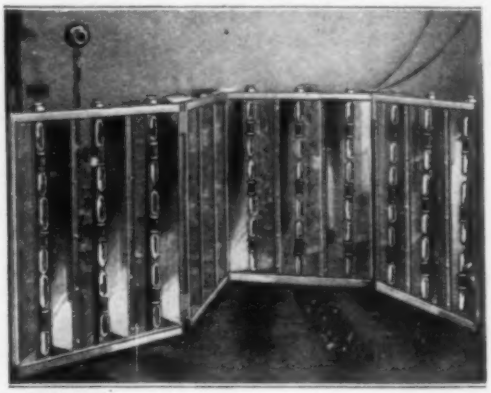
The race was the result of a wager made between Walsh and two jockeys, named Sande and Fator. It was held at the famous Aqueduct Race Track on Long Island, N. Y. Walsh's speed enabled him to beat the horse by a good lead.

## ROOFED-IN WATER RESERVOIR PROVIDES TENNIS COURTS

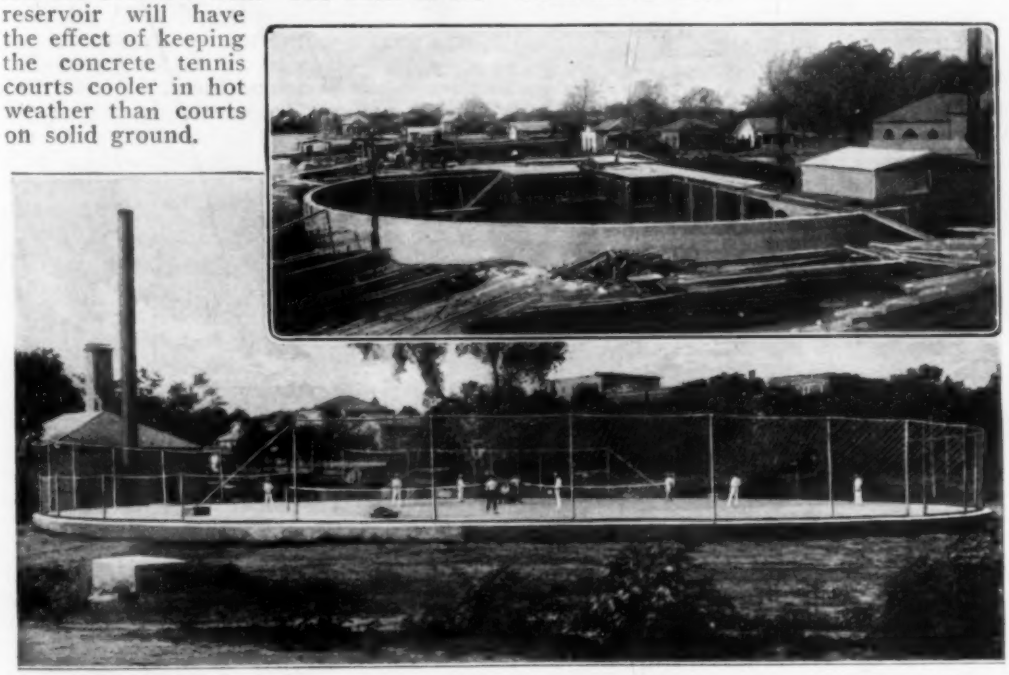
What was formerly an unsightly dumping ground at Arkansas City, Kan., has now been made to serve a double purpose—first, as a 2,000,000-gal. reinforced-concrete water reservoir, and second, as courts for playing tennis and volley ball. The new reservoir adjoins a small city park that is thus enlarged, offering more opportunities for play. The roof slab, 5 in. thick, was divided into 24-ft. squares, with expansion joints, which were also cast free from the supporting beams by the use of tar-paper joints. The manhole openings and ventilators were so placed that ample space was provided for two tennis courts. Pipe couplings were installed in the roof slabs for the net posts, and sockets provided around the wall for posts so that the entire area could be fenced in. The reservoir is 156 ft. in inside diameter and 14 ft. deep below the overflow weir. The water in the reservoir will have the effect of keeping the concrete tennis courts cooler in hot weather than courts on solid ground.

## ELECTRIC-BATH CABINET MADE IN FOLDING FORM

Electric-light baths have proved to be of great value in the treatment of various diseases, and a folding cabinet that can be used at home, should be welcomed by those needing such attention. The new cabinet has four sections, so that it can be folded small enough to be placed out of the way behind a door or in a closet when not in use.



The Four Sections of the Folding Electric-Bath Cabinet: There Are 12 Rows of Lamps, with Reflectors in the Cabinet, and a Connection for Each Row is Mounted on the Top



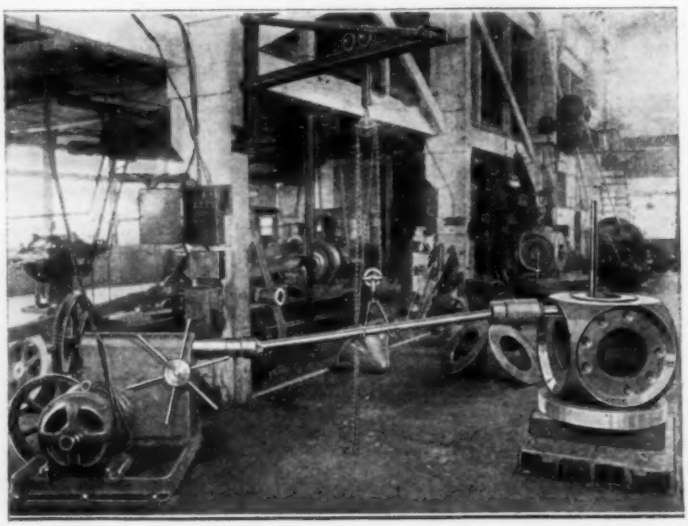
Above: Two-Million-Gallon Water Reservoir Before It was Roofed In, as Seen Below. The Roof, Made of Concrete Slabs, Accommodates Two Full-Size Tennis Courts, Which are Screened In to Prevent the Balls from Straying. Pipe Sockets are Provided in the Concrete for the Screen and Tennis-Net Posts

## DRILLING AND STUD-SETTING MACHINES FOR PROPELLERS

With the use of two new machines, the time consumed in drilling and assembling a propeller is said to be reduced from 50 man-hours to as little as three. These machines are respectively a propeller-blade drill and a stud setter for the hub. The propeller blade is set, with its flange downward, on top of the drilling machine, where it is centered and held by three clamps. A handwheel, in connection with a horizontal spindle and a bevel gear, rotates the blade-carrying part of the machine, so that the flange is moved as required for drilling each hole correctly. Within the rectangular body of the machine, below this, is the drill, which is controlled by a crank handle on the outside vertical face. The drill is positioned with a handwheel beside this crank. Adjustments for drilling the blade flanges can be made with extreme accuracy. The other machine is motor-driven, and sets the studs in the propeller hub after the holes are drilled.

Propeller Blade with Its Flange Clamped to Top of Drilling Machine: Handwheel at Right Rotates Blade into Position for Drilling with Drill inside Machine

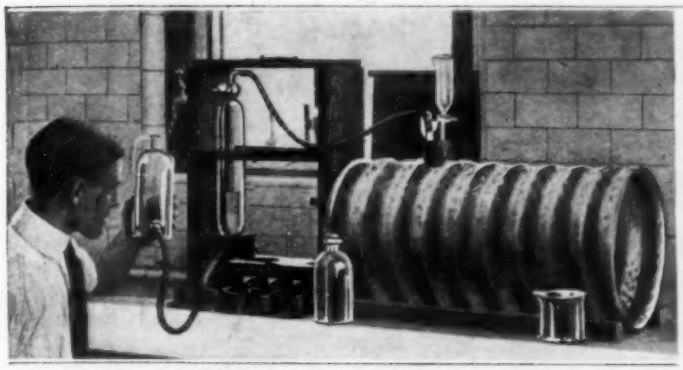
¶ Those wishing further information on anything described in the editorial pages can obtain it by addressing Bureau of Information, Popular Mechanics Magazine.

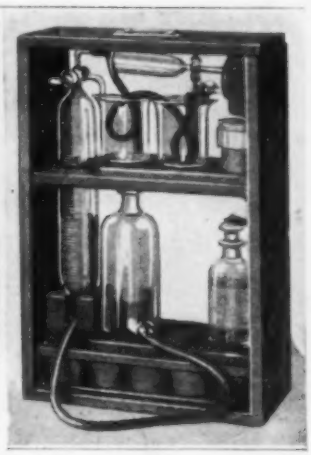


Motor-Driven Machine Setting a Stud in a Propeller Hub: The Holes for the Other Studs can be Seen Already Drilled and Tapped. The Driving Shaft Is Flexible, and can Set Studs in Any Position

## CONTEST DRAWS 10,000 IDEAS TO INCREASE USE OF RUBBER

Results of a prize contest for ideas of new uses, or of extending present uses, of rubber, have just been announced. About 10,000 suggestions were received, from more than 2,000 persons, by the Rubber Growers' Association, Inc., of Great Britain, which offered the prizes, totaling £5,000, or about $25,000 at normal exchange. Though the results were extremely disappointing to the judges, who state that hardly a suggestion was made which had not been anticipated by Goodyear in his book published in 1855, it is thought that the contest will give a great impetus to all the lines suggested. Prizes were awarded for suggestions for using rubber in sponge form for upholstery and mattresses; in liquid form with paint, for preserving wood and metal against the action of sea water, and to prevent the fouling of ships' bottoms; in paint for general decorative and preservative purposes; for automobile mudguards and curtains; with cement, for building purposes; for heat-retaining covers for hot-water cisterns; for the construction of sea buoys; for lining egg boxes and bottle-packing cases; in the con-





Determining the Weight of Galvanized Coating: The Acid-Resisting Ring Is in Place with the Tubing Connecting It to the Burette in the Cabinet. The Leveling Bottle is being Held at Measuring Level. At the Right, the Apparatus is Shown in Its Cabinet

struction of ship and wharf fenders; for washstand tops; under carpets in place of paper or felt; for fixing window glass in the place of putty; for cistern-chain handles; for clothes pegs or hooks; as fillets for patternmakers; in caps, for the ends of ladders to prevent slipping; for bouncers attached to footwear; in equipment for the arctic regions; as linings to preserve bleaching vats; in bellows, particularly for foundry purposes; as slip-on jar and bottle covers; in crêpe form for rough-surfacing cement; as covers for door handles; for phonograph-table tops; for kneecaps for coal-mine workers; in the composition of certain lubricants, and for water deflectors to be used on the handles of mops and brooms.

## TESTING DEVICE WEIGHS GALVANIZED COATINGS

The galvanized coating on sheet metal or wire is usually specified to be of a required weight per square foot. There has been developed an instrument for determining the weight of galvanized coating on a known area by test, either in the laboratory or in the field. The operation of the instrument is based upon the action of hydrochloric acid on the galvanized coating, the hydrogen gas produced being collected and measured. A flat acid-resisting ring of known area, sealed with acid-resisting wax to the object to be tested, has inserted into it a filling tube provided with a glass stopcock, and beside this two exit tubes, which are connected by a rubber tube to a graduated glass tube, or burette, filled with water. Another rubber tube from the bottom of the burette connects it to a leveling bottle. By treating the ring successively with small amounts of hydrochloric acid and antimony-chloride solution, when the leveling bottle is held so that the water in it and in the burette are brought to the same level, the volume of hydrogen in the burette can be measured, and by this means, in proportion to the known area of the ring, the weight of the coating per square foot can be calculated with sufficient accuracy.

## TOUCH-TYPEWRITING STUDENTS AIDED BY KEYBOARD SHIELD

To aid students in learning touch typewriting, a combined keyboard shield and divider can be attached to the regular typewriter. The shield covers the keyboard in such a way that it does not interfere with operation, but prevents the student from watching the keys and drifting into the sight habit. It also serves as a convenient support for a notebook. The divider separates the keys operated with the left hand from those operated with the right, and keeps the hands from wandering over onto the wrong part of the keyboard.

Keyboard Shield and Divider, Attached to a Typewriter, at the Left: The Shield may be Used to Support a Notebook, as Shown at the Right

## PRESENT SIXTY-POUND FRUIT CAKES TO FAMOUS PERSONS

Several hundred 60-lb. fruit cakes were placed on display in Seattle, Wash., not long ago. These cakes were made and

This 60-Pound Fruit Cake, Specially Made for Pope Benedict XIV, Was One of Several Hundred Presented to Famous Men and Women

sold by a local cake bakery, to be presented to famous men and women in all parts of the world. Some of the persons for whom cakes were made were President and Mrs. Harding, the president of France, the king and queen of England, the king and queen of Belgium, the president of China, the king of Italy, the king of Sweden, Mary Garden, Pope Benedict XIV, Thomas A. Edison, Henry Ford, and Chief Justice Taft. Each cake was decorated with appropriate designs and flags.

## FOG SIGNALS CONTROLLED BY USE OF WIRELESS

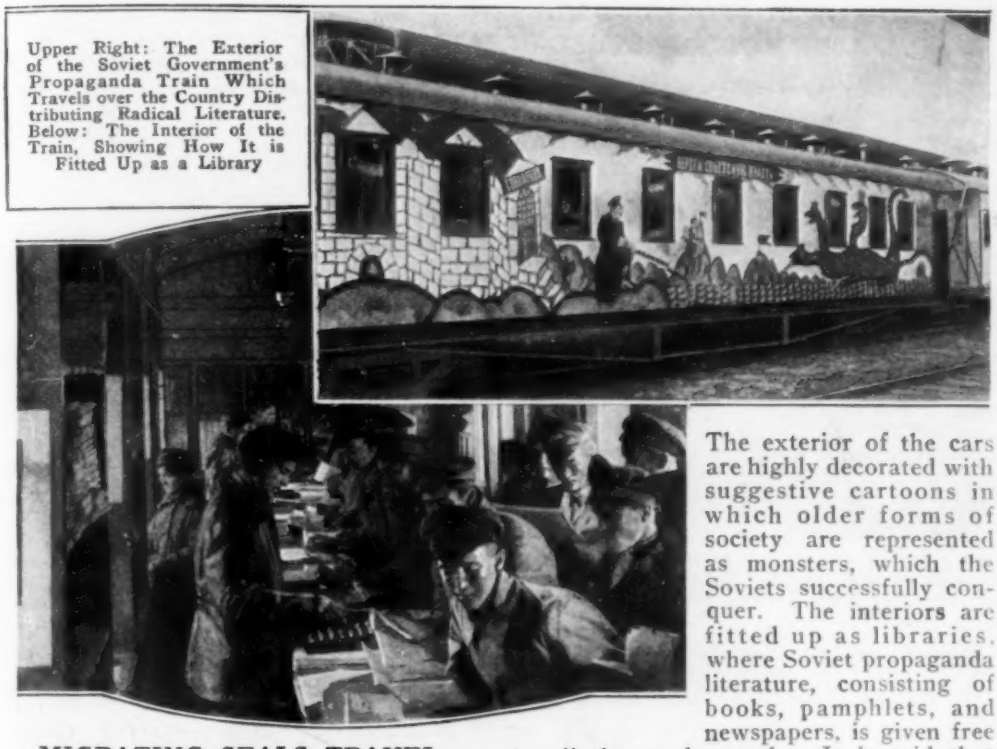
Controlling fog signals by the aid of wireless is a development that will be appreciated by seafarers, as they have been urging protection of this kind for some time. A wireless transmitter, suitably located on shore, sends out a series of "dots," which are received upon a small aerial on the fog-signaling apparatus. These dot impulses in turn operate a relay, which controls the valve of the gas, or compressed-air tank, and thus sounds the fog signal. It is said that the system has proved entirely satisfactory wherever tried, and also that it has continued in operation even under the most adverse weather conditions. Apparatus of this description is now being used to protect the shipping along the Clyde, in Scotland.

## AIRPLANE AND AUTOMOBILE TIE IN TUG OF WAR

A Novel Tug of War, between an Airplane and an Automobile, Which Resulted in a Tie

At a recent California air meet, one of the feature events, a tug of war between an automobile and an airplane, attracted much attention. The ends of a strong rope were attached to the rear of the car and the fuselage of the plane. At a given signal both drivers started their motors. The two machines seesawed back and forth across the field, amusing the spectators, but neither gaining a permanent advantage. After this had gone on for some time, the judges were finally forced to declare the contest a tie.

These Two Machines, Pulling Each Other Back and Forth across the Field, Furnished Much Entertainment for the Spectators at a California Air Meet



Upper Right: The Exterior of the Soviet Government's Propaganda Train Which Travels over the Country Distributing Radical Literature. Below: The Interior of the Train, Showing How It is Fitted Up as a Library

The exterior of the cars are highly decorated with suggestive cartoons in which older forms of society are represented as monsters, which the Soviets successfully conquer. The interiors are fitted up as libraries, where Soviet propaganda literature, consisting of books, pamphlets, and newspapers, is given free to all those who apply. It is said that the peasants look forward with eagerness to the arrival of these trains.

## MIGRATING SEALS TRAVEL IN MILITARY FORMATION

Little is known of the habits of Alaska fur seals after they have left their breeding grounds on the Pribilof Islands, but a report from John Kunder, former keeper of the Farallon Light Station, on an island west of San Francisco, adds some interesting information. In March, 1920, Kunder saw a herd of about 10,000 seals approach the island from the south. They advanced in a line about two or three miles long, stopped for a moment and then swung around in perfect military formation and advanced rapidly in a west-northwest direction. Three years before, Kunder saw a similar performance by a herd of about 15,000 seals. These are, as far as known, the only times that seals have been seen in large herds in the open sea, where they usually appear either singly or in scattered groups.

## READING MATTER DISTRIBUTED BY RUSSIAN GOVERNMENT

As a means of distributing its radical literature, the Russian Soviet government uses railway trains which travel through the country continuously, and from which are given radical lectures.

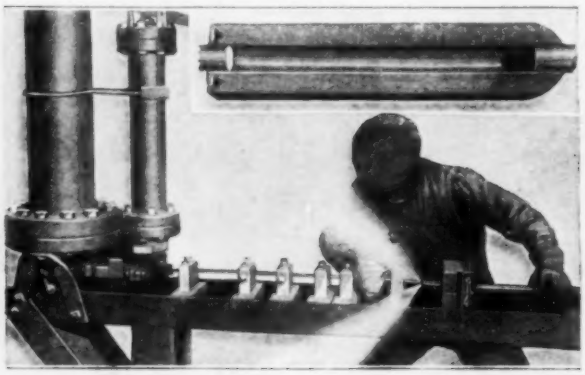
## FIRE-EXTINGUISHING PISTOL ALSO REPELS BURGLARS

Poison gas in some form or other is apparently being applied in Germany to domestic uses, judging from an advertisement in a Berlin paper. A picture of a pistol, that looks very much like an automatic with an enlarged barrel, is described as being for protection against fire and burglars. The means of protection is not mentioned, but presumably it is something on the order of the ordinary chemical extinguisher, and is operated by pulling a trigger instead of turning it upside down. The gas that is then discharged is apparently equally effective against attack by fire or burglars.

German Pistol That Offers Protection against Fire and Burglars, by Discharging a Gas

## "SAND-BLAST" PROCESS USED IN MAKING HOLLOW STEEL

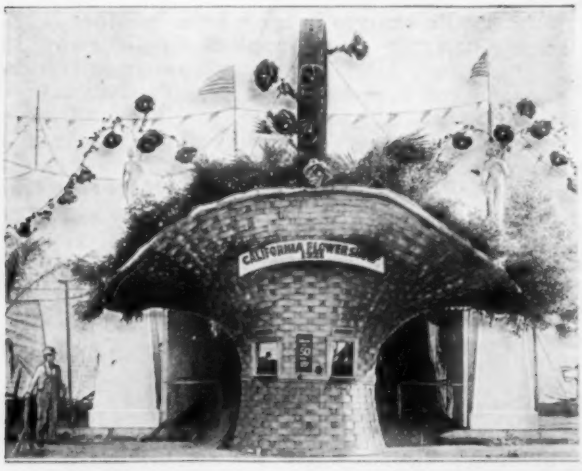
A patented process for making hollow steel, such as used in mining drills, is applied by an American company. This steel must be very hard in order to enable the drills to cut through stone. In the new process a thin steel tube is thoroughly cleaned, then filled with sand, and inserted in an ingot mold, where hot metal is poured around it. After the ingot is cast, the sand remains in the tube to maintain its shape while the ingot is rolled. Following the rolling process, the sand filler is removed by a sand blast. This apparatus has a compressed-air tank, a sand reservoir, and a small tube connected to both. When the air is released from the tank, it passes a hole at the bottom of the sand reservoir, and sucks a certain amount of sand therefrom. This jet of mixed air and sand possesses great cutting power, and it is stated that a round hollow steel bar, 20 ft. long and 1¼ in. in diameter, can be cleaned in one minute.



Air and Sand Tanks, at the Left, and Small Tube Carrying the Sand-Blast Mixture: The Workman is Cleaning Out a Piece of Hollow Drill Steel. Insert: Cross Section of Drill-Steel Ingot

## ATTRACTIVE ENTRANCE GREETS FLOWER-SHOW VISITORS

Perhaps the most attractive feature of the California Flower Show, held at Los Angeles, was the entrance. A huge basket was built directly in its center, and a small room in the lower part served as a ticket office. The upper part was completely filled with shrubbery, palms, and giant artificial poppies, the state flower of California. In the center of each poppy was mounted an electric bulb, and, at night, the effect was most pleasing.



Novelty and Beauty are Strikingly Combined in This Entrance to the California Flower Show

## REMARKABLE WATCH CARRIES MANY COMPLICATED DIALS

One of the most complicated watches ever made has been produced by a company in London, Eng., for an American customer. The intricate mechanism is inclosed in a case 3 in. in diameter and about 1½ in. thick. Dials in the front carry the usual hour and minute hands; a hand showing the difference between mean and true sun time; a fly-back second hand moving in fifths of seconds, the indications of which are added on a dial at the side of the face, up to 12 hours; a record of the phases of the moon; the day of the week and month. A dial on the back is graduated to 24 hours, two sets of 12 hours each, for forenoon and afternoon time. Its hour and minute hands show sidereal or astronomical time. The watch strikes the hours, quarters, and minutes, repeating them at any desired time.

¶ As a result of traffic policemen giving the right of way to private automobiles, mistaking them for fire trucks, the Chicago city council has passed an ordinance, effective January 1, prohibiting the use of the same shade of red for private automobiles as that used by the fire department.

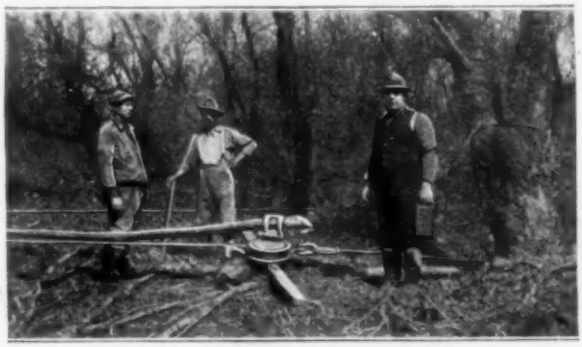
# HAND-POWER STUMP PULLER RAISES SUNKEN ENGINE

AN impromptu demonstration, as sensational as it was successful, was made recently in the Pacific Northwest of a newly invented one-man stump puller of original design.

A donkey engine, weighing nearly 10 tons, was being taken across a swamp under its own power, when, just as what appeared to be a patch of solid ground in the middle of the bog was reached, one of the sled runners broke through, and before skids could be brought into use, the donkey capsized. In a few minutes the engine had settled until only the steam pipes and cylinder on one side could be seen above the surface.

The 10-Ton Donkey Engine Capsized in a Swamp: Except for a Cylinder and the Steam Pipes, the Engine was Entirely Submerged in Muck

The inventor of the new stump puller happened to be in the vicinity showing his device at work on logged-off land. He rushed to the scene and fastened his tackle to the fast-disappearing donkey engine. The puller weighs, with complete equipment, only 135 lb., as compared with the 20,000-lb. weight of the donkey engine. But in one hour 15 minutes it had pulled the donkey upright. The boiler was then guyed to a near-by tree with a line, but before steam could be gotten up, the engine had settled again so that the firebox was submerged. Thereupon the pulling device was placed ahead of the donkey, the tackle reset, and before nightfall the engine was extricated from the bog.



This Is the Hand-Power Stump Puller with Which the Donkey Engine was Hauled Out of the Swamp. The Lever Shown on the Mechanism Is 12 Feet Long

The Raising of the Donkey Engine by Means of the Stump Puller and a Rope Fastened around the Top of the Sunken Machinery: In This Manner the Engine was Dragged to Dry Land

The new stump puller consists of eight simple parts, only three of them moving. Without hook and cable, it weighs less than 100 lb. It is operated under normal conditions by one man with a 12-ft. sweep, which gives a straight-line pull of more than 20,000 lb. Equipped with one block, it pulls 20 tons, and with a luff, more than 150 tons, it is claimed. A drum protects the heavy steel

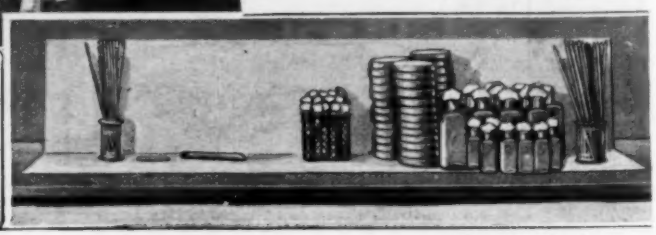
cable used on the machine from cutting and grinding, and an internal safety dog holds the load at any time. There is a ratchet on the sweep, so the operator need not endanger himself by stepping over the cables.

## SHAPE IRREGULARITIES SHOWN BY DIAL RECORDER

Emery wheels on grinding machines, compound rests on lathes, and similar attachments often become loose, and the result is that pieces in the process of working get slightly out of round. An indicator built of three pieces—a base, a vertical arm, and a cylindrical impulse recorder—constitutes a device for discovering such trouble. The recorder is held up to the piece of spinning stock by the vertical arm which can be set at any angle desired by loosening the joint bolts, adjusting the recorder to the position necessary and tightening the bolts again. The contact with the spinning stock to the cylindrical recorder is established by a little ball on the recorder's end. This ball rubs on the stock and, as it is moved up and down by the undulations of the piece being worked, transmits the varying impulses to a gauge which records in thousandths of an inch how far the piece is out of shape.

## GERMS IN MILK ARE COUNTED BY ECONOMICAL PROCESS

Germs in milk can be counted quickly by means of a new testing cabinet designed at the University of Wisconsin, and which is being used with success by dairymen of the middle West. Instead of costly laboratory equipment, the tester consists of a field outfit in a small metal case, weighing but 20 lb. when fully equipped, and with which 96 samples can be analyzed on a single trip. The case is heat-insulated so that the contents may be kept at the proper temperature at all times. In making a test, a measured drop of milk, and a drop of germ food, called agar, are spread together on a glass slide, or plate, over an area of about .16 sq. in., with a sterilized needle. The plate is then placed on one of the many shelves in the cabinet, or incubator as it is termed, and allowed to "grow" for a period of eight hours. At the end of this time, the plate is removed and the germs dried upon the glass, after which they are colored with a stain, so that they can be easily counted by the aid of a microscope. Thus the number of germs in any given quantity of milk can be determined. The method is said to be so simple of operation that a man can be taught to do this work in one week. This new field outfit reduces the amount of glassware ordinarily used, to an amazing minimum.



Above: Placing a Drop of Milk, Together with Germ Food, on a Glass Plate. The Small Case with Numerous Shelves for Holding the Plates is Seen in the Background. Below: Amount of Glassware Required by Old Method at Right, and at the Left, the Few Pieces Needed with the New Cabinet

Illustrating the Manner of Unloading a Carload of Coal Screenings with the Aid of Water Which is Pumped from the Pond and Directed into the Cars at Either End: The Screenings are Washed down the Chute into the Pond, Where They Are Safe from the Danger of Spontaneous Combustion

## OLD CLAY PIT USED TO STORE COAL SCREENINGS

Good use is being made of an old clay pit at Springfield, Ill. Coal screenings are stored here throughout the dull seasons. The pond, which covers two acres and in parts is over 50 ft. deep, will hold about 75,000 tons. It was formerly used for the storage of zinc screenings, and consequently the pipes were already in place for the handling of coal. An electric pump has been installed. With this, water is pumped from the pond through two pipes that reach either end of the car, thus washing the coal into the pond. The company estimates that coal can be unloaded in this manner at a cost of three cents a ton, and that by reversing the operation the coal can be reclaimed at a cost of 10 cents a ton. This storage method prevents spontaneous combustion, which is ordinarily an almost constant menace. It also gives the company washed screenings to market when there is the right demand.

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¶ The Popular Mechanics Bureau of Information offers its free service to all readers of this magazine. Names and addresses of manufacturers and dealers in articles described, and any other details in our possession, will be promptly furnished by addressing the Bureau.

## ARTIFICIAL ARM OVERCOMES CRIPPLE'S HANDICAP

During the medical exhibition in Central Hall, Westminster, London, Eng., a demonstration was given which showed the great possibilities of a new artificial arm. This appliance makes it possible for a person who has lost one arm to do almost anything which he was able to do before his loss. The principal feature of the demonstration was the playing of a violin. A one-armed man was able not only to play, but to play quite well.

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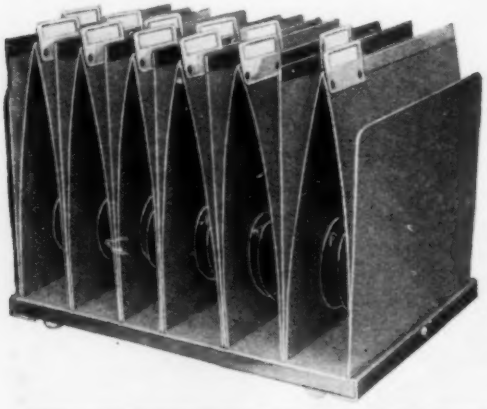
A Demonstration of a New Artificial Arm at Recent Medical Exhibition at Central Hall, London: The Man Was Able to Play Quite Well

## NEW DESK TRAY BOTH WINDPROOF AND CONVENIENT

A new desk tray holds papers in a vertical filing position and prevents their being blown away by drafts from electric fans or open windows. It consists of a base with endpieces and fixed guides at regular intervals. Between the fixed guides are compression guides made of two pieces of cardboard hinged at the upper edge. Spiral springs between the two parts keep them spread and hold the papers in place.



When Compressed, the Springs, Extending the Guides, Lie Flat, Taking Up No More Room Than the Ordinary Compressor Blocks

## MOTOR TRUCK TRANSPORTS TRAIN IN NOVEL MANNER

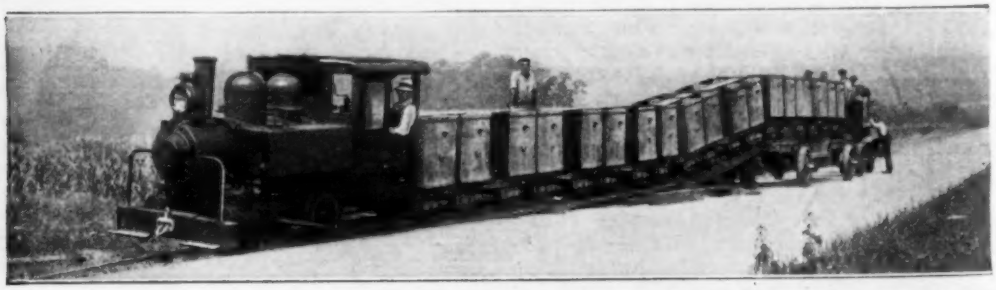
It became necessary to transport a train of "batch boxes," used in the construction of a cement road forming a part of the Pennsylvania highways, and this was done in a novel manner by the use of a large motor truck. A section of railroad track was inclined to the level of the deck of the motor truck, on which rails were mounted. The train was then backed up this incline until three of the batch-box trucks were on top of the motor truck. These were then taken to their destination, where they were unloaded down a similar incline. The operation was repeated until the whole train, as well as the locomotive, were transported.

## BATTERY VOLTAGE REVERSES AT LOW TEMPERATURES

Recent tests to determine the reliability of batteries at low temperatures, resulted in the startling discovery, that a reversal of their polarity occurred at 170° F. below zero. The experiments were conducted by the Bureau of Standards, and, so far as known, the phenomenon has never been observed before. It was stated, however, that the reverse currents were so small that there was no probability of their being used to recharge the battery.

## BOOSTERS' MEETINGS CALLED TO ORDER BY HORN

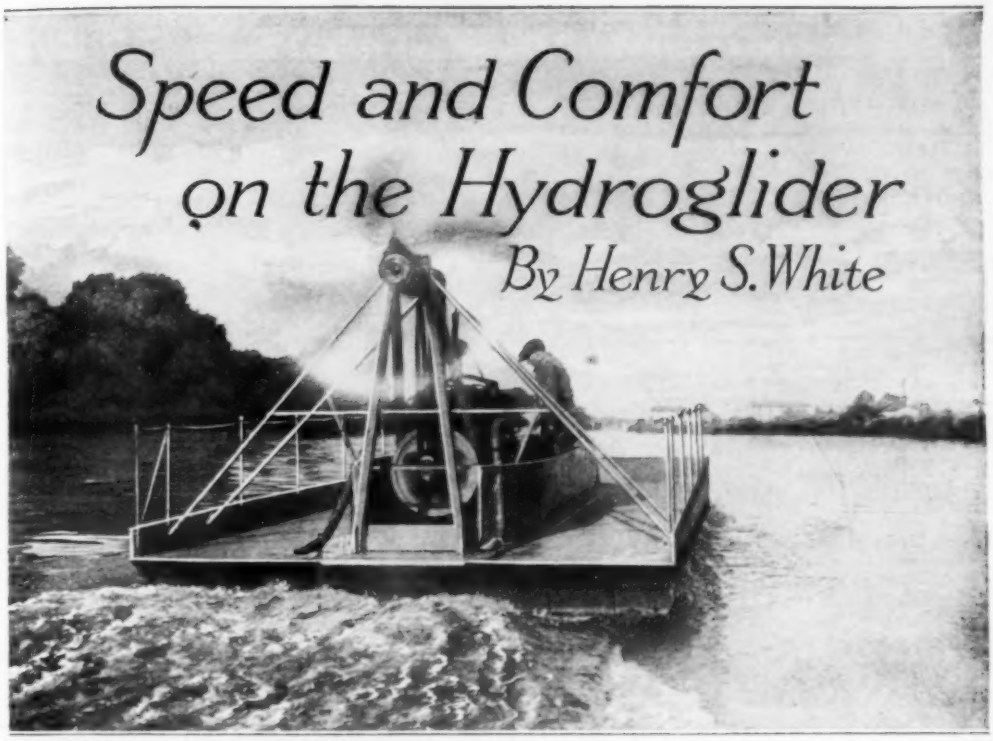
The gavel, or hammer, the symbol of the knocker, has disappeared at the meetings of the "100 per Cent Club" of San Francisco, and has been replaced by the horn, the symbol of the booster. Since the club is an organization of boosters, D. R. Pinney, the president, decided that it would be most appropriate to call the meetings to order with a horn.



Train of "Batch Boxes," Used in Building This Cement Road, being Loaded, Three at a Time, on the Large Motor Truck at the End of the Inclined Track: These Batch Boxes are Then Transported, and Unloaded in a Similar Manner, Whereupon the Motor Truck Returns and Repeats the Operation

# Speed and Comfort on the Hydroglider

By Henry S. White



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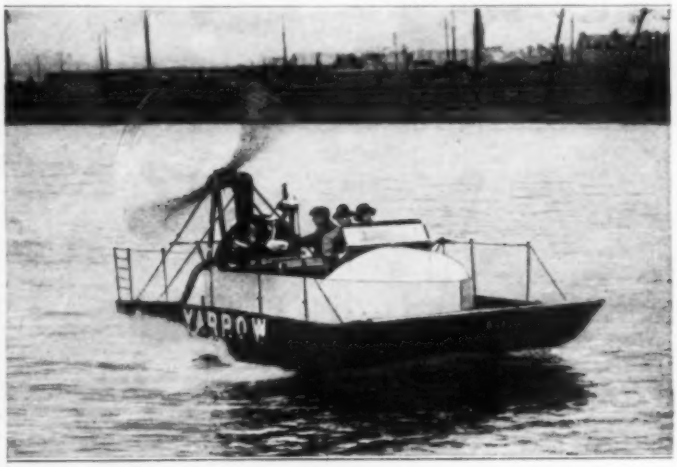
An Example of the Modern Hydroglider, without Cabin Accommodation, Built for Any Form of Rough River Work: The View Shows the Stern with the Aerial Propeller Revolving at High Speed

IN land transportation, within the last 20 years, there has occurred a transformation from the horse and buggy to the high-speed automobile. In the navigation of rivers and lakes a similar development is now taking place. The ancient paddle wheeler is being supplanted by the modern hydroglider. The development has been gradual. It began, as in the case of the land vehicles, with the introduction of the internal-combustion engine. This led to the first design of the hydroplane, or craft that skims on the surface rather than plows through the depth of the water. In this connection there have been many modifications of hull design. Until recently they were driven by immersed or semi-immersed propellers, which, besides lacking in efficiency, were likely to hit any obstruction, or to get fouled by reeds or other weeds, which are common in shallow waters. Finally came the type now under development, which skims on the surface of the water, and is driven by an aerial propeller. These are known as water or hydrogliders. The pioneering work in this type was done by a French aerial engineer, who during the war developed a glider that proved to be of great service in the Mesopotamian river campaign. The most recent developments are exemplified




The "Yarrow," a Hydroglider Built on the Clyde, in Scotland, Which Attained a Speed of 50 Miles an Hour When Operating as a Passenger Boat, Not as a Racer, as Its Speed might Well Suggest

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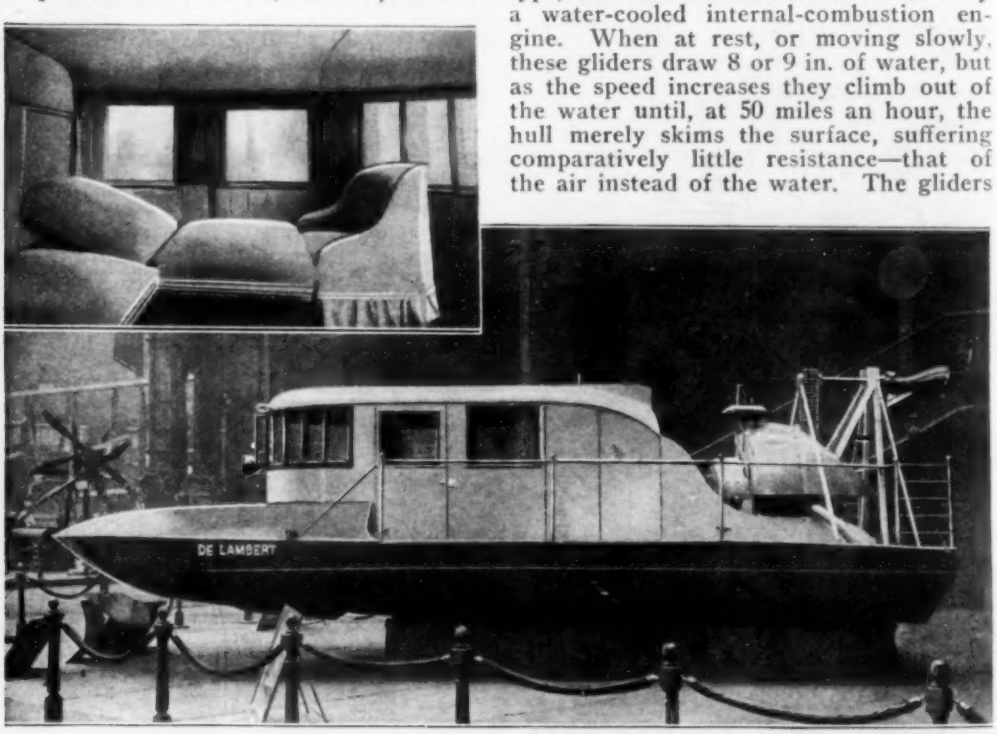
**French Hydroglider with Turned-Up Prow to Facilitate Gliding: Its Cabin Accommodation Closely Follows Automobile Lines, and Its General Appearance might Reasonably Suggest That It Is a Water Taxi**

in a glider built on the Clyde, in Scotland, called the "Yarrow," which has attained a speed of 50 miles an hour. In this type all models are characterized by a rectangular hull built up of five or more separate caissons, and between the caissons a narrow space of varying form according to its position in the hull, and to the size and horsepower of the boat. This construction gives great elasticity, and is in every way superior to the older type, known as the "stepped" hull, especially for high speeds. These newer hulls are uncapsizable, and are easily made unsinkable. The propeller is of the aviation type, and is driven with silent chains by a water-cooled internal-combustion engine. When at rest, or moving slowly, these gliders draw 8 or 9 in. of water, but as the speed increases they climb out of the water until, at 50 miles an hour, the hull merely skims the surface, suffering comparatively little resistance—that of the air instead of the water. The gliders

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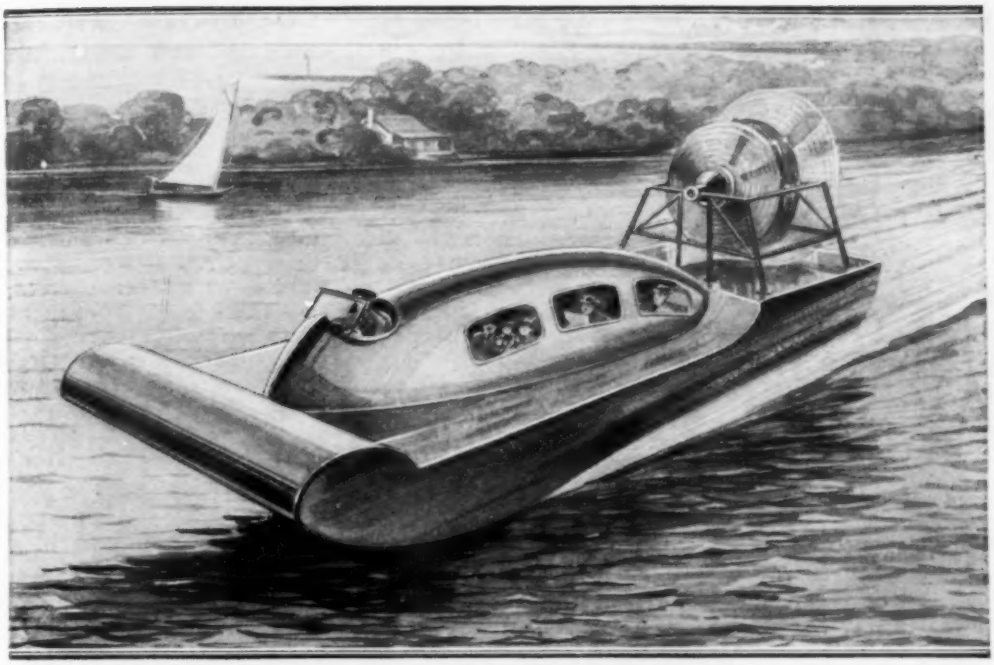
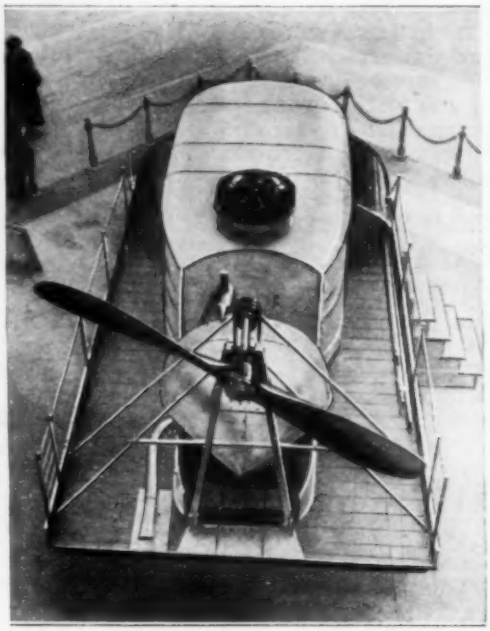
**Latest Development of the Hydroglider by the French Engineer Who Was the Pioneer of This Type of Craft: This Model Follows Automobile Lines, and Has a Limousinelike Body. The Inset Shows Its Pullmanlike Seating and Sleeping Accommodations**



Modification of the Hydroglider as Designed by a Belgian Lady: Its Special Novelty Is in the Curved Shape of Its Hull Bottom. It Has Exceptionally Luxurious Cabin Accommodations. The Motor at the Stern Is of the Rotating Air-Cooled Type, Formerly Used on Airplanes

are controlled and steered by an ordinary automobile wheel.

Fundamentally, all of these hydrogliders are similar. They vary in size and power, and also quite considerably in cabin design and accommodations. One, called the "Farnum," that is used on the river Seine, in France, as a sight-seeing boat, is said to have attained a speed of 56 miles an hour. Another, the special design of the French aerial engineer referred to above, has a cabin much on the lines of an enlarged limousine, with Pullmanlike seats that can be converted into sleeping berths. Another of this type has a wide curled-up prow that facilitates gliding. One, still more recent, is the invention of a Belgian lady, and has the bottom of the hull shaped like a figure "3" laid on its back. This hydroglider, still under construction, has exceptionally luxurious cabin accommodations, and is distinguished by the fact that its aerial propeller is driven by a rotating air-cooled engine, such as were used on airplanes, particularly in France, before the war.



All-Metal Hydroglider on Exhibition at Paris Aero Show: It was Specially Designed as a Racer

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¶Twenty years ago the first sardine-fishing boat with a gasoline engine to appear at Eastport, Me., which is the center of the sardine industry of that state, chugged up the harbor. Today the entire fleet of such boats, estimated at 1,800, is equipped with gasoline, kerosene, or crude-oil engines.

## DRILL PRESS MOUNTED ON AUTO FOR ENTERPRISING SALESMAN

"Seeing is believing," may be an old saying, but it has been proved a true one by a tool salesman of Cleveland, Ohio.

**This Drill Stand Holding a Portable Electric Drill was Placed on a Salesman's Car for Demonstrating Purposes**

Discovering that his prospective customers were inclined to be skeptical of mere catalog photos and descriptions, he decided to use practical methods. Accordingly, a drill-press stand was attached to the running board of his automobile, and a portable electric drill was placed in the stand. Thus he was enabled to give convincing demonstrations, which resulted in increased orders.

## SOCIAL LUNCHEON SERVED IN SIXTY-FOOT BOILER

Members of a social colony in New York City were the guests, not long ago, at a luncheon, given by the officials of a power company, which was served in the firebox of a 60-ft. boiler. Certain of the guests, residents of the neighborhood, had complained of the smoke and cinder nuisance prevailing because of the proximity of the company's power plant. The gathering in the boiler was for the purpose of demonstrating that every known appliance for the prevention of these inconveniences had been installed. The demonstration and luncheon proved a success, and apparently all points of friction were amicably smoothed over.

## NEW METHOD OF RATE CHANGES FOR FOREIGN MONEY ORDERS

Because of the rapid fluctuations in foreign exchange rates, a new conversion table and system of changing foreign money-order rates has been adopted by the Post Office Department, which will save purchasers considerable loss. The tables have been sent to all international money-order offices. Rate changes are reported to central offices, in different zones, by wire. These offices notify all others in their zone by mail. The complete notification, which formerly required two weeks, is now accomplished in two days.

## SIMPLE CHART FOR FIGURING PAY ROLLS QUICKLY

Offices may save time in figuring pay rolls by the use of a new calculating chart. It is mounted on a cast-iron base with a felted bottom. A case, of enameled sheet steel, revolves on this base and the charts, of extra-heavy cardboard, slide in and out of it with a slight pull on the index tabs. On the edge of the case are celluloid strips, listing hours from 1 to 99. On the cards are columns showing wages at rates from 12½ cents to $1.50 per hour, for hours from 1 to 99. The card is pulled out till the proper rate column is opposite the hour column. The proper number of hours is located and the total read opposite. Similar charts are provided for other kinds of calculations.

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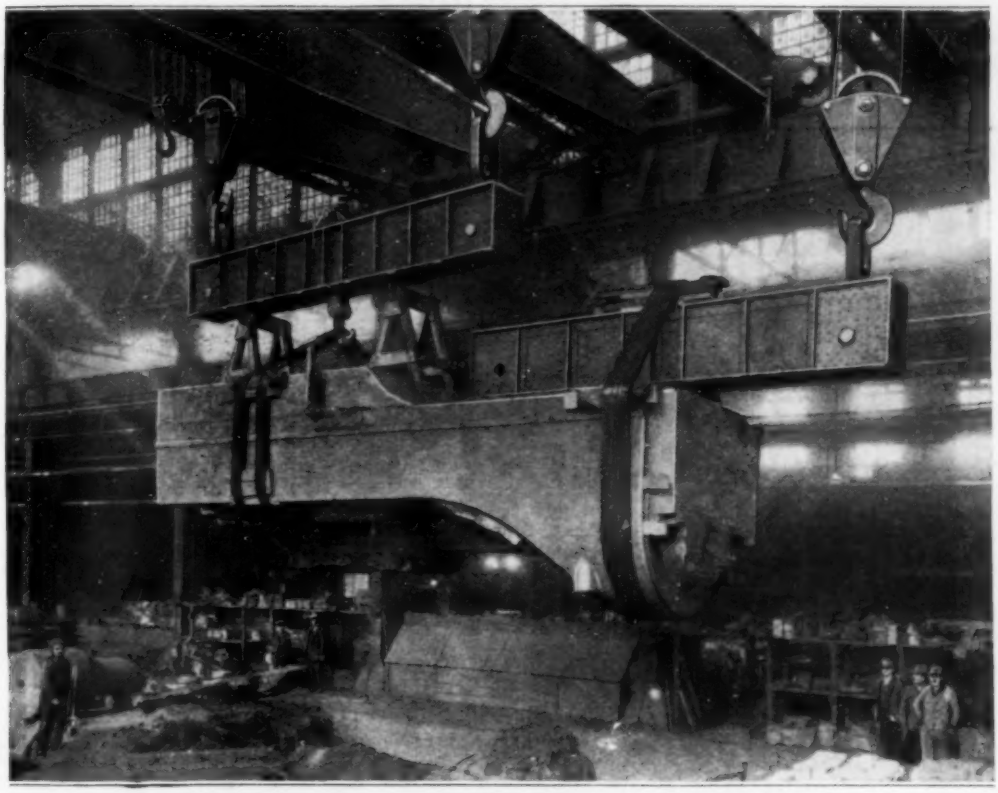
**The Calculating Chart Takes Up Little Space and is Easily Moved Wherever Needed**

¶ Whenever you find that you wish to know more about any article in this magazine, write our Bureau of Information.



**HUGE CASTING CARRIED COÖPERATIVELY BY THREE CRANES**

IN a large foundry recently, the difficulty of lifting and moving a huge casting, weighing 225 tons, was overcome by doing the work coöperatively with three overhead traveling cranes, two rated at 60 tons each, and one at 40, thus overloading them about 40 per cent. From two of the cranes was suspended a plate girder that carried the heavier end of the casting, and a similar plate girder was lashed to the other end, and was carried by the third crane. The casting was for a large engine bed.

## GRANITE ARCH TO MARK STATE LINE ON MERIDIAN TRAIL

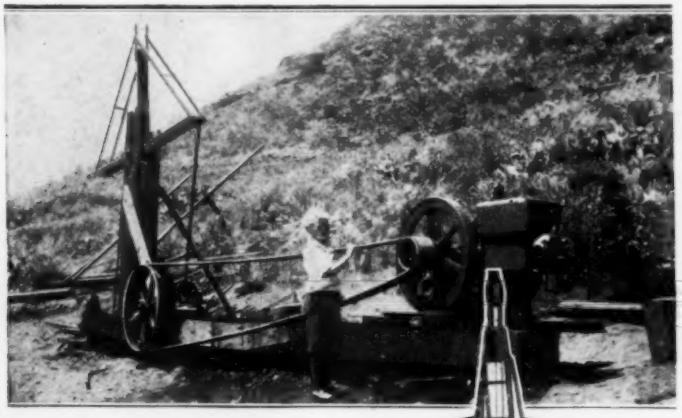
Marking the point where the Meridian Trail crosses the line between Illinois and Wisconsin, a granite arch will be erected as a gateway to the two states. This highway, which will probably prove to be the first hard road linking Canada with the Gulf of Mexico, after passing through Wisconsin and Illinois, will continue along the Mississippi River to New Orleans. Twenty miles of it, between Rockford, Ill., and the state line, have been surfaced with concrete and opened with a dedication ceremony on Nov. 11, 1921. A large part of it has been completed through Wisconsin, and much of the Illinois section is to be finished next summer. The design for the arch, which is to cost about $8,000, has been approved.

**Architect's Drawing of the Meridian-Trail Gateway between Illinois and Wisconsin: Inscriptions on Each Side of the Arch will Inform the Tourist He Is About to Enter Another State**

# A SHALLOW-WELL OIL FIELD

By ALBERT MARPLE

ONE of the most unusual oil fields to be found in this country is located in the hills between Conejo grade and Camarillo, Calif. The depth of the wells in this field ranges from 40 to 50 ft., and oil is struck, usually, at about 30 ft. The oil is so close to the surface that, with the pump removed, a person can see it by looking down the 6-in. casing used in connection with all these wells.



A Small Gasoline Engine Furnishes Power to the Pumps of an Entire Row of Wells through a Single Cable, Which is Fastened to the Pump at Each Well

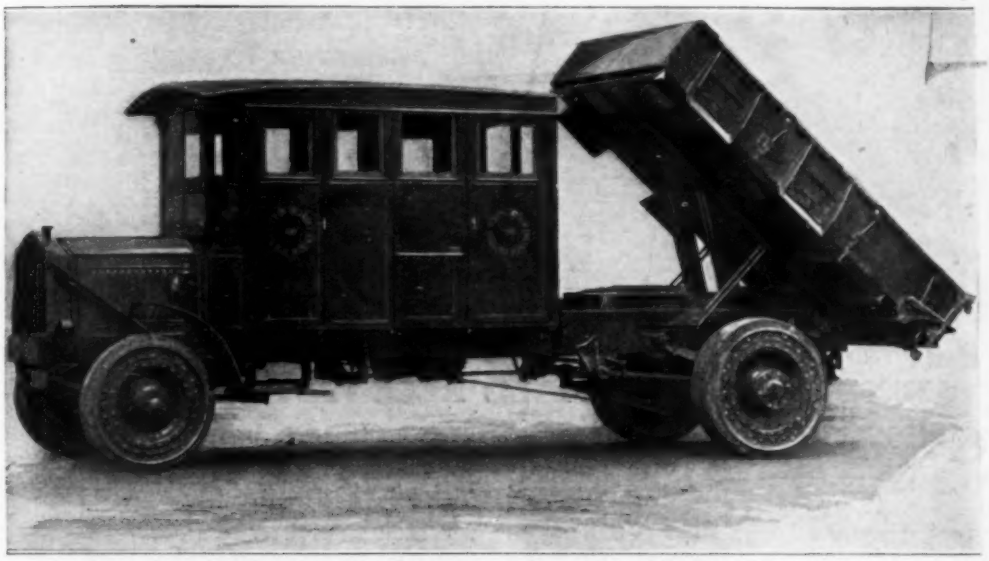
In drilling such wells, a regular water-well drilling outfit is used. Two men are required for each rig, and it takes about a week to complete the drilling of one well. The average cost is about $150. In some of the more level stretches of the field the wells are "set out" like an orchard, in rows about 50 ft. apart and with the wells in each row a like distance apart. For operating these wells a cable is run along an entire row. It is fastened to the pump at each well, so that all the wells in the string, a dozen perhaps, are pumped with one operation. From each well the oil is carried off by means of a 3-in. pipe, all of the pipes emptying into a large tank.

The quantity of oil produced by these wells makes them a remarkably good investment. Many come in with 50 bbl. a day, and the average output is about 25 bbl. There are wells in this field that were drilled 20 years ago and are still producing a fair quantity of oil. This field is now paying so well that some wells which were abandoned 10 years ago are now being reopened and operated at a good profit. Six or eight wells can be placed on a single acre of ground here, while five acres are needed for the average deep well.

Above: An Ordinary Water-Well Drilling Outfit, Used for Drilling in This Shallow Oil Field. Below: The Wells are Set in Rows like the Trees in an Orchard

## RUBBER TUBING EXCLUDES DUST AND MOTHS FROM CLOTHING

Clothing is perfectly protected from both dust and moths by a new wardrobe in which rubber tubing is employed as a means of sealing. The tubing is used as a cushion around the door of the wardrobe, with the result that an absolutely tight joint is formed when the door is closed. These wardrobes are made as separate pieces of furniture or can be built into a house.



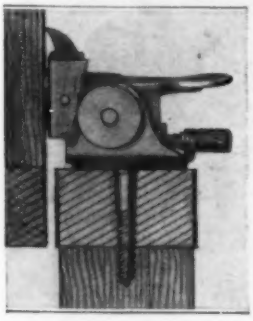
This Five-Ton Truck was Specially Built for Emergency Street-Repair Calls. The Inclosed Body Carries the Workmen Needed and Gets Them All to the Job at the Same Time and as Soon as the Materials Which are Hauled in the Dump Body

## REPAIR TRUCK TRANSPORTS BOTH MEN AND MATERIALS

Emergency-repair calls, of the paving division of the city of Detroit, Mich., are answered by an unusual type of repair-truck unit. It is a five-ton truck with an ordinary dumping body operated by a hydraulic hoist. In front of this is an inclosed body which accommodates 15 workmen. In this way it is possible to reach a job with both the materials and men needed in a single run, and the men have a very comfortable means of transportation.

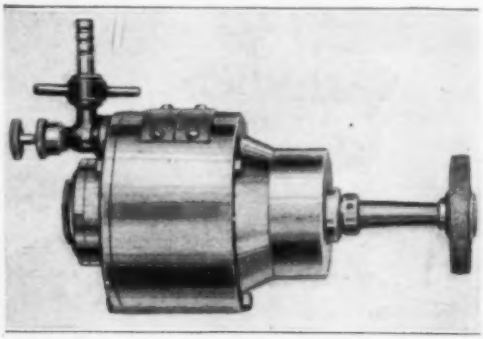
## SASH HELD IN ANY POSITION BY AUTOMATIC WINDOW LOCK

An attachment to the top of the lower sash that automatically locks a window at all times, whether opened or closed, and that prevents it from rattling, is now on the market. The upper sash may be lowered, or the lower one raised, and in any position the attachment keeps both locked. To release the lock, when it is required to raise or lower the window, all that is necessary is to press a small lever.

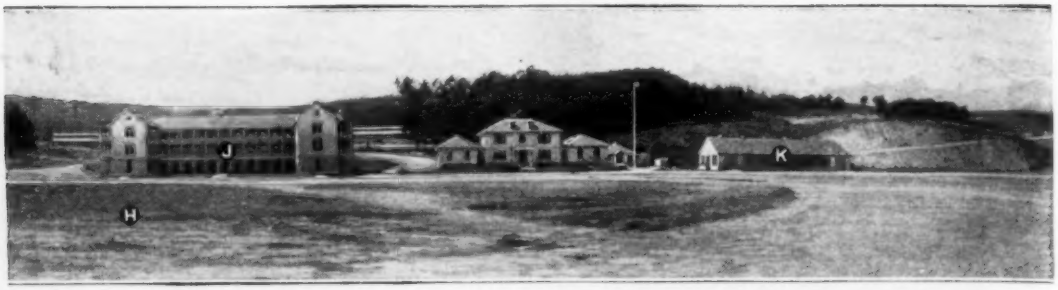


## SMALL TURBINE-TYPE GRINDER HAS SPEED OF 30,000 R.P.M.

Extremely high speed, without vibration, and consequently very high power in proportion to weight, are the distinguishing features of a new pneumatic turbine-type grinder. The turbine unit has an outside diameter of about 4¼ in., and weighs only 5½ lb. At its extreme speed of 30,000 r.p.m., it transmits ¼ hp. It can be used as a hand tool, and by mounting it on machine tools by various fixtures, work can be done in the original setting. In connection with a special mounting, it can be used as a bench grinder. It is provided with interchangeable arbors, allowing a quick change of grinding wheels. Besides grinding, the unit can be used for buffing and drilling.



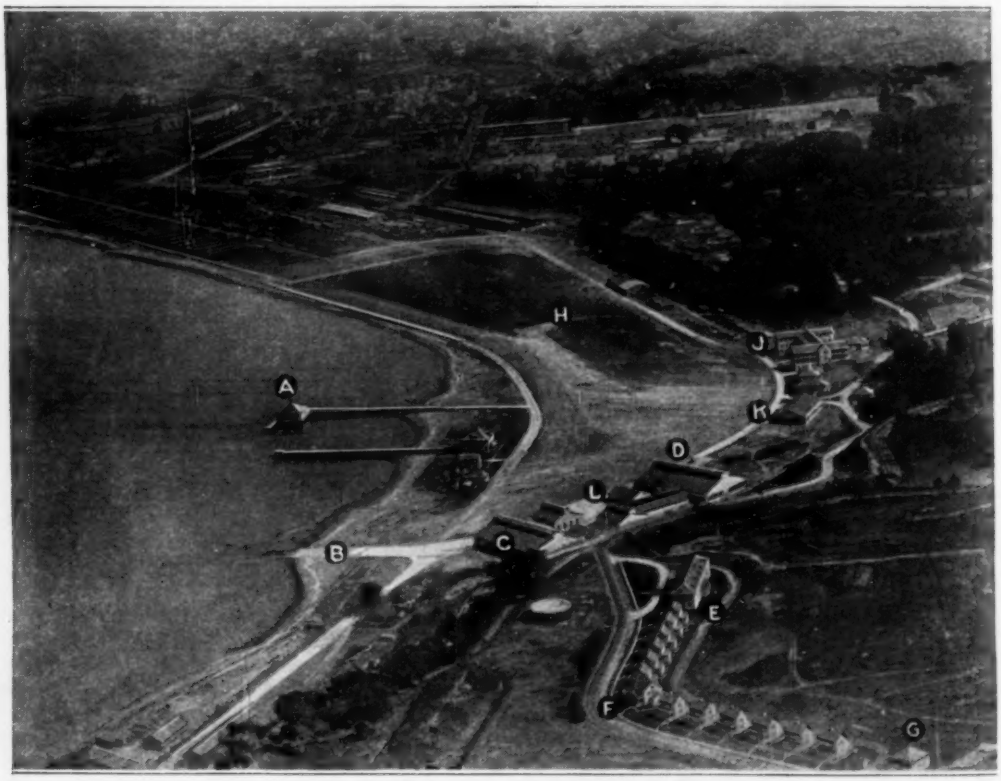
Pneumatic Turbine-Type Grinder That Has a Speed of 30,000 Revolutions per Minute



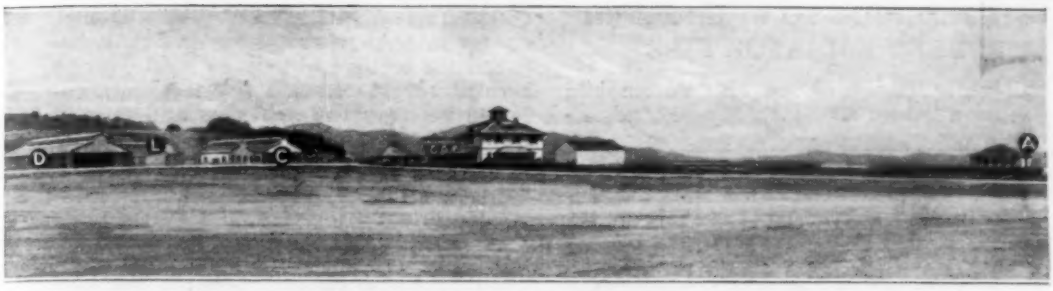

A Panoramic View of the New Crissy Aviation Field, at San Francisco, on the Former Site of the Panama-Pacific Consist of the Following: A, Boathouse Which will Accommodate the Speed Boats and H, the Landing Field; J, Living Quarters; K, Modernly

## $2,000,000 AVIATION FIELD RECENTLY COMPLETED

CRISSY FIELD, located on the old Panama-Pacific exposition grounds, has just been completed at a cost of $2,000,000. The buildings, which are of fireproof construction, include two hangars 160 ft. long and 100 ft. wide. They are equipped with rolling steel doors, each in 12 sections. One of the hangars is intended for seaplanes, having a concrete runway down to the bay. Special dollies were made, to fit under the pontoons of the planes, which are towed by small tractors. Gasoline is supplied to the front of each hangar by two 10,000-gal. tanks, but for emergency use, two hand pumps are provided. A large garage has been built to take care of the trucks and trailers used. One of these trailers carries a complete photographic dark-room equipment, and is hauled by a truck carrying a 3-kw. gen-




An Airplane View of the New Crissy Aviation Field, Showing the Same Buildings Indicated by the Same Letters as Those Seen at the Top of the Page: In Addition, This View Shows, at B, Concrete Runway for Seaplanes; E and F, Living Quarters; G, the Wireless Station. The Beauty of the Site Is Apparent in This View




Exposition: The Buildings are Constructed of Reinforced Concrete and Steel and Are Fireproof Throughout. They Three of the Hydroplane Tenders; C, Hangar for Seaplanes; D, Hangar for Land Planes; Equipped Garage; L, the Machine Shop and Testing House

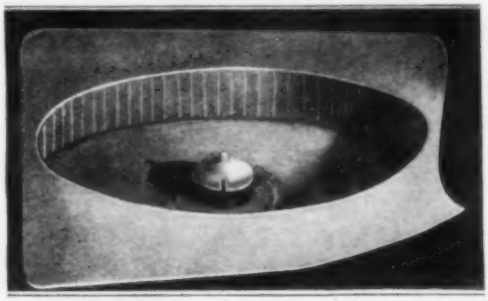
erator. Another truck, with two trailers, is especially designed for bringing in wrecked planes. The trailers have steel stands with padded bumpers to protect the wings.

## NEW DEVICE EASILY ADJUSTS HEIGHT OF CHAIR

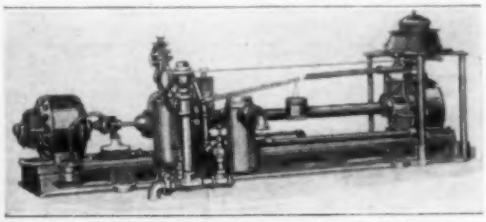
A new adjusting device for swivel chairs and stools is conspicuous for its simplicity of operation. The seat is supported on a notched upright and held by a catch. To adjust its height, it is only necessary to trip the catch by means of a spring lever and raise or lower the seat as desired. The device is made of steel throughout. Its easy operation assures adjustment to the most comfortable height for typewriting and various kinds of work.

## NEW SYSTEM BURNS HEAVY OIL IN SMALL HEATING PLANTS

An oil burner has been placed on the market which, it is claimed, makes possible the use of heavy fuel oil for heating residences or firing any small boiler, in place of the lighter and more expensive oils, such as kerosene. An improved feed and atomizer eliminates the obstacle of clogging, by impurities, which has in the past limited the use of heavy oils to large installations and left only the light oils available for the small plants. Fuel is drawn through a strainer into a compressor, and forced through a revolving needle valve into the feed pipe. The perfection of this valve was the first step in making the burner possible. The atomizer system consists of a cup, about the outlet of the feed pipe, and a cap above, both of which revolve. Oil flowing into the cup is mixed with air, thrown up against the cap and out into the combustion chamber. Centrifugal force carries the dirt to the sides of the cup. Clogging here is prevented by an agitator. This is a small metal strip, attached immovably to the feed pipe, and bent upward near the sides of the cup.



Interior View of a Firebox Equipped with the New Oil-Burning System: The Revolving Cap of the Atomizer can be Seen in the Center of the Box

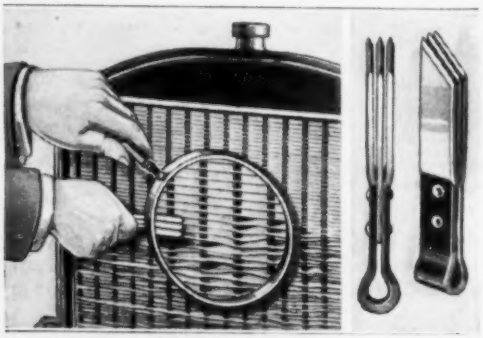


The Complete Oil-Burning Plant as It Appears Set Up, Ready for Installing under Any Boiler

¶ When you want anything and do not know where to get it, write Bureau of Information, Popular Mechanics, Chicago.

## SIMPLE TOOL TO STRAIGHTEN BENT RADIATOR FINS

Bent radiator fins, on any automobile having a flat-fin radiator, may be straightened quite easily with a small tool which was recently placed on the market. It consists of a flat piece of metal, bent double to form a handle and two prongs, or teeth. Another piece, inserted between the teeth, and held by rivets, forms a third tooth. In use the teeth are inserted between the bent fins and twisted from side to side.



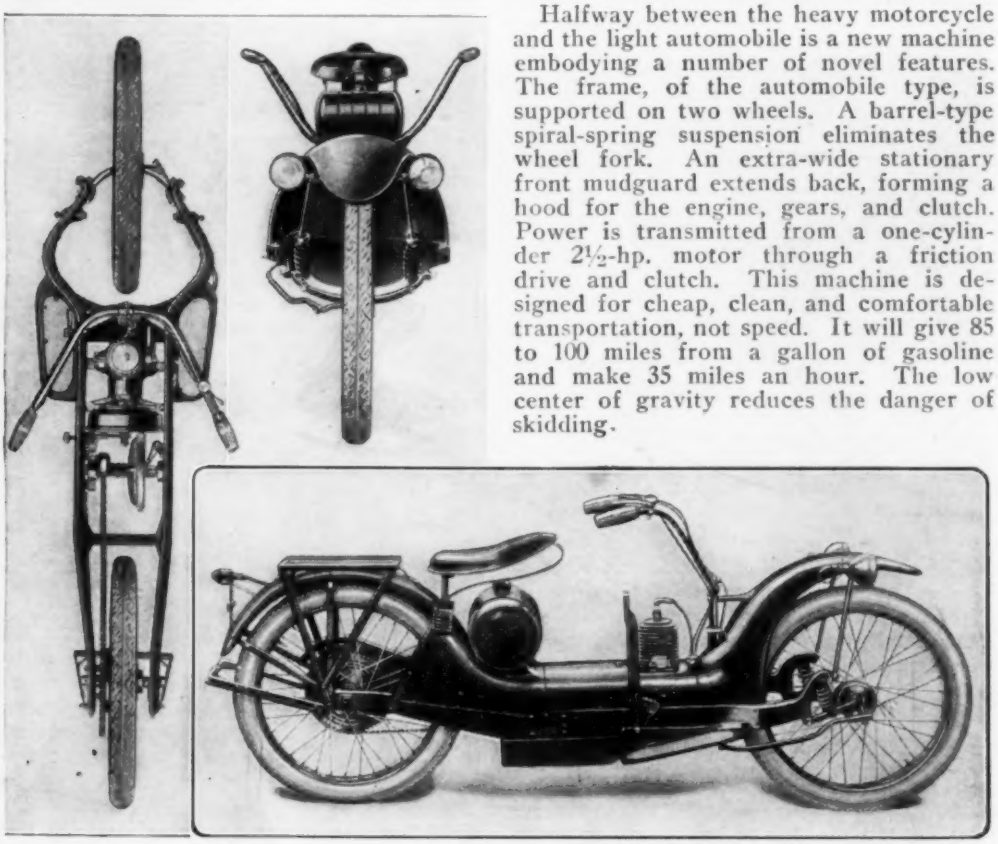
Straightening Bent Radiator Fins: At the Right Two Views Showing How This New Tool is Made

## OIL-REFINERY EXPLOSION OF PECULIAR NATURE

Oil refineries usually protect the distillation tanks against the entrance of water, but a laxity of this safeguard recently resulted in an explosion of one of these stills. Water in the tank produced a rise in pressure, due to the formation of steam. The safety valve operated, but the opening in this was not of sufficient size to allow the steam to escape fast enough, and the still exploded.

## MACHINE FILLS GAP BETWEEN MOTORCYCLE AND LIGHT AUTO

Halfway between the heavy motorcycle and the light automobile is a new machine embodying a number of novel features. The frame, of the automobile type, is supported on two wheels. A barrel-type spiral-spring suspension eliminates the wheel fork. An extra-wide stationary front mudguard extends back, forming a hood for the engine, gears, and clutch. Power is transmitted from a one-cylinder 2½-hp. motor through a friction drive and clutch. This machine is designed for cheap, clean, and comfortable transportation, not speed. It will give 85 to 100 miles from a gallon of gasoline and make 35 miles an hour. The low center of gravity reduces the danger of skidding.



Three Views Showing the Peculiar Features of Construction of a New Motorcycle Designed Primarily for Comfort, Convenience, Safety, and Economy of Operation: It Is Not a Speedster

## EXTERMINATION OF CRAWFISH STOPS CANAL-BANK LEAKAGE

Trouble is sometimes caused by the presence of crawfish holes, under water in canal banks, which cause leakage, and to eliminate these an experiment has been made that successfully exterminated the crawfish in a canal embankment 75 years old. After unsuccessfully attempting to stop the leakage with sheet piling and concrete, it was finally decided to try impregnating the soil with enough chloride of lime to kill the crawfish. It was necessary to get the lime down 16 ft. under water, and this was done by boring with post-hole augers. With these a barrage of holes filled with lime, and scattered through the earth with dynamite, was laid across the paths of the crawfish. This stopped the leakage.

## COMBINATION WALL REGISTER DOES NOT CUT INTO WALL

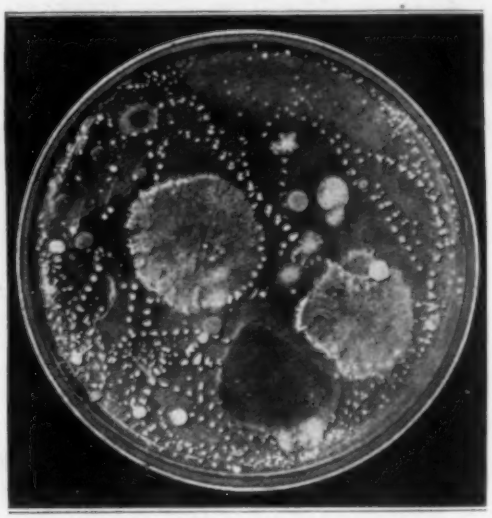
In the warm-air furnace-heating systems in common use, the registers are either in the floor or in the wall. Now there is a dual register that is partly in the floor and partly set against the wall. The part against the wall is the outlet for the warm air, and the part set in the floor is for the inlet of the return air.

## THE "FINGERPRINTS" OF THE MURDEROUS HOUSE FLY

A casual glance at the picture herewith would lead one to believe it was a bird's-eye view of a shell-devastated portion of France, but such is not the case. It is a record of the footprints, or "fingerprints" if you please, of the common house fly—murderer, food despoiler, and baby killer.

The fly was caught last fall and made to walk over a prepared medium of agar. Wherever its feet touched the medium a colony of bacteria grew. The performer of this experiment isolated 13 kinds of harmful bacteria from the footprints.

The picture also tells another story: While the fly left its footprints, it also left a memento of its approaching doom. The two large spots are mold colonies of the *Empusa muscæ* variety. Each fall



**Footprints of House Fly on Bacteria-Breeding Gelatine: Every One of the Little Dots Represents a Colony of Bacteria Carried by the Fly's Feet; the Large Spots Are Growths of a Mold That Causes the Death of the Flies**

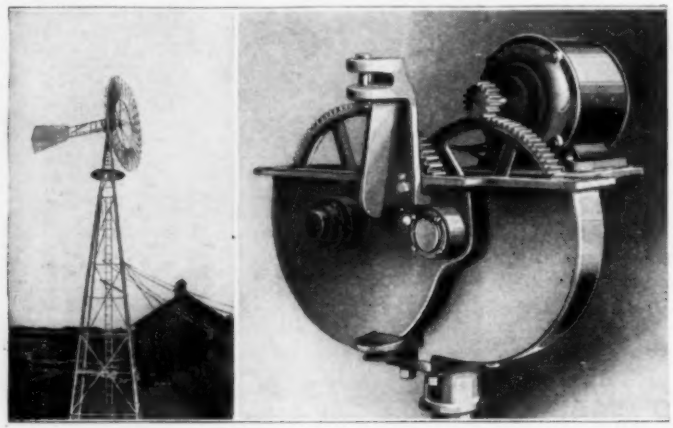
this mold starts to propagate, and the spores float through the air. They attach themselves to the fly under the wings, and start growing inside its body. In a short time the fly becomes so weakened that it can scarcely crawl. Finally, it stops, but the white shroud of fungus keeps on growing. If some scientist could so cultivate the mold that it would start its work in the summer, the pestilential fly would soon disappear.

## MOTOR GLOVE HAS FLASHLIGHT IN BACK FOR SIGNALING

Quite novel among the automobile signals which have been developed lately, is a glove with a small flashlight set in the back. It is provided with a red bulb and operated by pressing a push button, placed under the thumb. It is used to warn cars approaching from the rear that the driver intends to stop or turn. The battery is said to be sufficient for 2,000 flashes.

## WINDMILL STORES ELECTRICITY FOR ELEVEN DAYS' USE

Although there have been many attempts made to harness the wind to generate electric power, yet work along this line is still in the experimental stage so far as actual farm installations are concerned. Thus considerable interest is attached to the announcement made by a windmill manufacturer that he has at last succeeded in constructing a model that, he believes, will meet all the requirements in this special line.



Left: The Steel Windmill. Right: The One-Kilowatt Generator and the Reduction Gears Which are Directly Connected to the Windmill Shaft. The Lower Parts of the Gears are Immersed in Oil

The combined windmill, generator, and storage-battery outfit is designed to transform the wind power into electric energy, store it in storage batteries, and use it as required about the farm. On the main casting at the top of the tower is mounted a 1-kw. generator. It is geared directly to the shaft of a 14-ft. steel windmill. The spur gears are carried on roller bearings, the entire reduction gearing running in an oil bath. The generator gives a constant voltage over a speed variation ranging from 750 to 2,500 r.p.m. The storage battery has a capacity of 280 ampere-hours and will store enough electricity to operate the lights on an average farm for 11 successive days without wind. This is a condition of weather seldom, if ever, encountered. The collector ring is so designed that it allows the wheel to turn and face any wind.

Main wires lead down from the collector ring to the switchboard and battery. The switchboard is very simple and is provided with cut-out switch, ammeter, voltmeter, and a specially designed relay which permits the apparatus to charge at 16 volts in moderate winds and automatically change over to a 32-volt charge in winds of 18 miles an hour or more. This makes it possible, according to the inventor's claim, to take advantage of all wind conditions, and get maximum charging efficiency from winds ranging from 7 to 30 miles an hour.

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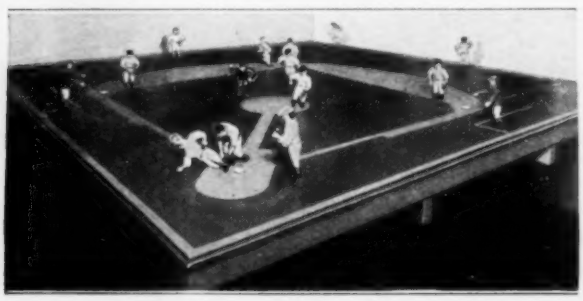
## BASEBALL SCENE WHITTLED FROM WOOD WITH KNIFE

For 12 years August Bruyere, of Green Bay, Wis., devoted his spare time to reproducing a baseball game in wood, with a jackknife as his only tool. The scene represents a double steal with the runner out at home. The field is 8 ft. square and is painted grass-green, except the base lines which are of sand color, and the bases and pitcher's slab which are gray. Each figure is 6 in. high. The players having the field have light cream-colored suits, and blue socks, belts, and caps. Those at bat have light gray suits, and green socks, belts, caps, and sweaters. The umpire is dressed in dark blue.



A Baseball Game Carved in Wood, Which Is the Product of Many Hours of Patient and Skillful Work, with a Jackknife as the Only Tool

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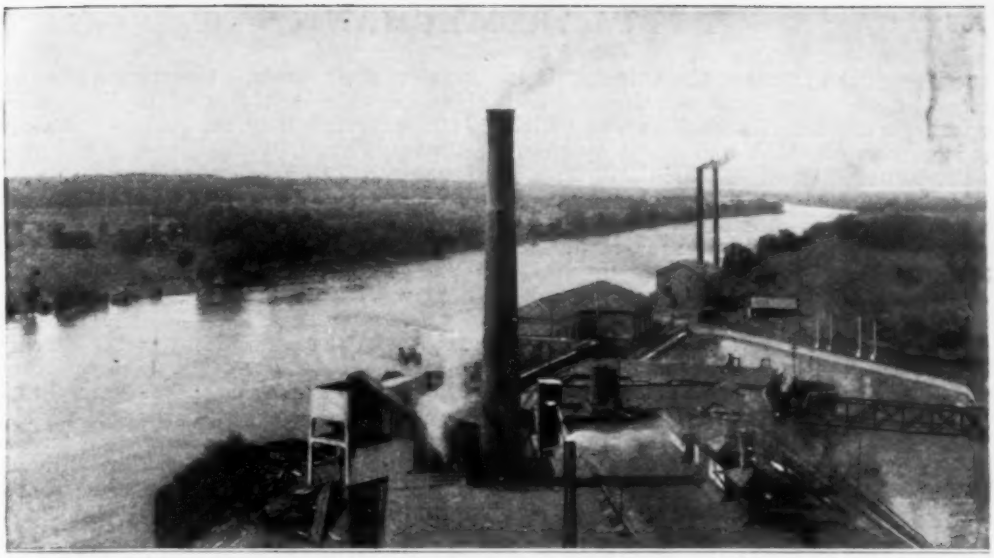
¶Names and addresses of manufacturers of articles described in this magazine will be furnished free by our Bureau of Information.



The Illinois Waterway as Seen from a Point in Marseilles, La Salle County, Where the First of the Five Locks Connected with the Enterprise is Now being Built near the Bend in the River Seen in the Background: The Lock will Be One of the Largest in the World

## FIRST LOCK BEING BUILT FOR ILLINOIS WATERWAY

IN connection with the Illinois Waterway—the $20,000,000 improvement of river navigation authorized in 1919—the excavations for the first lock are now in progress at Marseilles, La Salle County. The lock will be 600 ft. long from gate to gate, with an over-all length of 938 ft., and a width of 110 ft., making it nearly

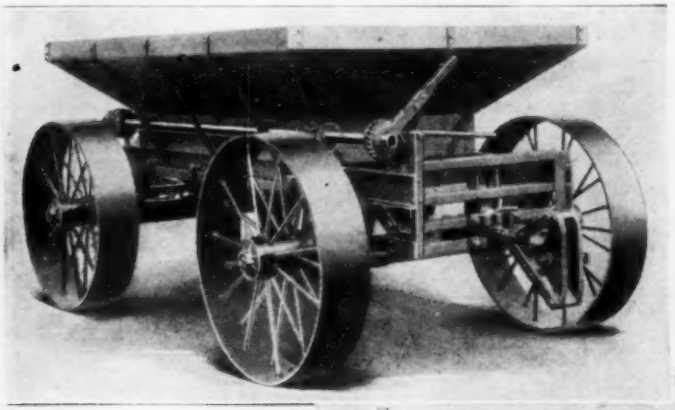
Excavations in Connection with Initial Work on the First Lock, near Marseilles, La Salle County, for the Illinois Waterway Improvement That will Make It Navigable for Large Steamers from Chicago to the Gulf of Mexico: The Lock will Be Parallel with the Illinois River, Which Is in the Background near the High Tower

the size of the Panama Canal locks. It is situated at some distance from, and parallel with, the Illinois River, to which it is connected above and below by channels, 40 or 50 ft. wide, which will have a difference in level of 21 ft. At the low level there will be 14 ft. of water over the lock sills, and the walls will be 50 ft. high. The lock will be filled and emptied by means of conduits, 12 ft. in diameter, built into its concrete walls. The lock is on the south side of the river, and as the railroads are all on the north side, a spur was built to the bank, and a temporary bridge was thrown across the river, as well as a 1,400-ft. span cableway. The bridge is in sections, which can be removed at flood time. The concrete mixing plant is on the north side of the river. Its two 1-yd. mixers are installed so that ¾-cu.yd. trucks can run under them and receive their loads. Concrete construction on this lock started in September. It is expected that the lock will be finished by Oct. 1, 1922. The whole project is scheduled to be completed some time in 1926, when deep-water navigation will be open from Chicago to the Gulf.

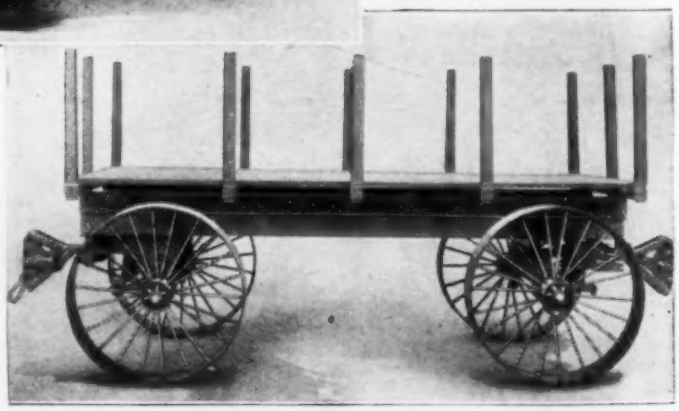
The course of the Illinois Waterway extends from the power plant of the Sanitary District of Chicago, near Lockport, to a point on the Illinois River near Utica. At the junction of the canal with the Desplaines River, it passes through the city of Joliet, and thence along the course of the Illinois River until Utica is reached. The channel of the waterway will have a minimum width of 150 ft., but through Joliet this width is to be increased to 270 ft., in order to provide room for dockage at wharves on either side, without interfering with the passage of vessels.

## NEW TRAILER HAS WIDE RANGE OF ADAPTABILITY

A trailer, specially designed for heavy duty with tractors, in trains of from four to eight, embodies a number of features which give it a wide range of adaptability. This trailer is provided with a hopper dump body. By removing a few bolts, the hopper body and dumping mechanism may be removed, leaving an all-steel frame, upon which any sort of body can be mounted. A drawbar at each end makes the unit reversible. The rear drawbar and wheels are locked in a central position by means of a locking pin, and slots in the drawbar and drawbar rest. Those which happen to be in front are left free to swing. Two heavy coil springs at each end take up all torsional strains. A hinged link connection, between each two trailers, folds back within the drawheads, so that, in backing, they come in contact and form a connection of ample rigidity to meet any demand placed upon it.



The Heavy-Duty Trailer Equipped with a Hopper Dump Body Which can be Quickly Removed from the Frame



The Hopper is Replaced by Any Other Type of Body. A Drawbar is Provided at Each End for Making Up Trains. Both Pairs of Wheels Are Movable, but Either can be Locked, Making the Unit Reversible

House being Moved along a Street in Newark, New Jersey: The Building Was So Wide That It Played Havoc with the Trees on Either Side

Showing How the House, While being Moved along the Street, Totally Destroyed Some Trees

Above: Residents of the Neighboring Houses Beginning the Wreckage of the House. Right: All That was Left of the House

## HOUSE-MOVING ENTERPRISE WITH UNEXPECTED ENDING

House moving along streets in a city is generally accompanied by a certain amount of excitement, but not often to the degree that was caused recently by the attempt to move a house along a Newark, N. J., street, where the building itself was so wide that it damaged the trees that lined the road on either side of it. After traveling about 50 ft. from its original location, the damage done aroused the neighboring residents to such a degree that they first caused the city authorities to order the work stopped, then gave the owners of the house a certain time to do something about it. When this time expired and nothing had been done, they did something themselves—so effectively that, at the end of the doing, there was not a vestige of the house left at a higher level than three feet.

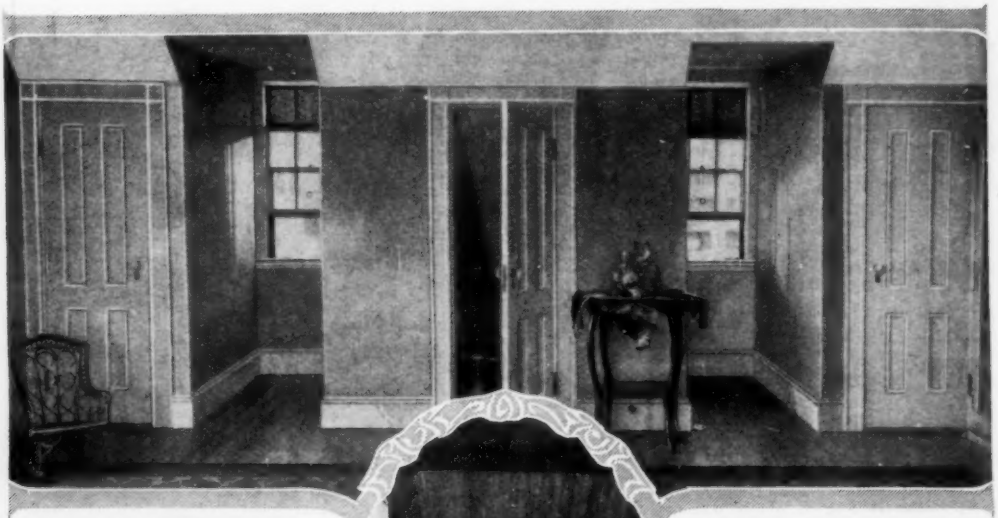
## CLAY DIGGER RESEMBLES PNEUMATIC HAMMER

A clay-digging tool that is said to do work equivalent to that of seven men digging by hand, is now on the market. It is similar in principle and appearance to the ordinary pneumatic riveting hammer. In place of the hammer is a spade. It has a long stroke, and its speed is 800

Clay-Digging Tool That Is an Adaptation of a Pneumatic Riveting Hammer, with a Spade in Place of the Hammer: It Strikes 800 Blows a Minute

blows a minute. Like the pneumatic hammer it can be operated in a space too limited to swing a pick.

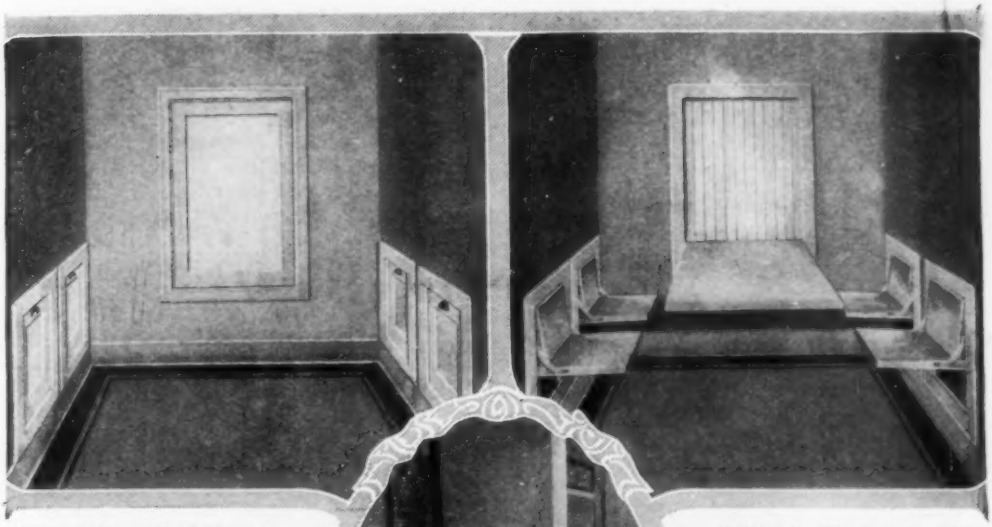
# CAMOUFLAGE CONVENIENCES CHARACTERIZE



Above, Left and Right: A Model Nursery and Playroom. Though the Toys may be Strewn from One End to the Other One Moment, the Next Sees the Room Spick, Span, and Tidy, Everything being Whisked into the Three Closets, One of Which may Be for New Playthings, the Second for Those Not Quite So Fresh, and the Third for Such as Are in Need of Repairs

Left: What in Most Dwellings Is an Unlovely Spot, Buried Away under the Eaves, in One Home has Become an Attractive Attic Nook, Fitted with Shelves for the Storage of Seldom Used Odds and Ends, and a Long Rod, Well Supplied with Hangers, Where Out-of-Season Garments are Disposed, Out of the Way, Protected by Moth and Dust-Proof Bags

A Concealed Stairway Affords Access to Attic Storeroom. Finished on Its Underside with a Full-Length Panel, Matching the Rest of the Woodwork, It Gives No Hint of Its Existence When It is Folded Up. Right: The Cord, Which Passes over a Pulley in the Attic, Has a Counterweight Attached to It. A Slight Lift on the Stairway Sends It Up into Its Niche, Where the Counterweight Holds It Securely



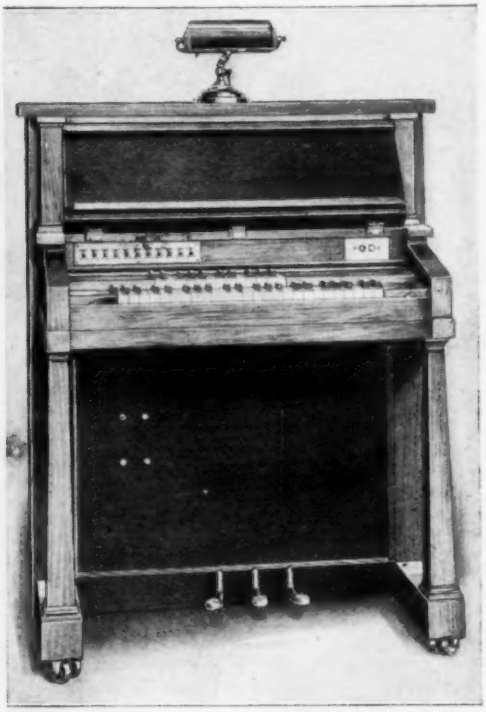
Above, Left and Right: A Masterpiece of Interior Camouflage. One Not Familiar with the Design would Never Suspect That He Was in the "Fade Away" Breakfast Room of a Cleverly Thought-Out Dwelling. With the Family and Guests Assembled, the Signal is Given, and, Presto, the Wall Panels Drop Outward, and the Room Becomes a Dining Hall

Left: The Fireplace Is a Concession to Sentiment and Custom, and Serves No Useful Purpose Other Than to Mask a Tiny Closet Built behind It. Here are Kept in Orderly Array, Always Findable When Wanted, but Never Underfoot Causing Vexation and Unnecessary Work in Moving Them About, Those Hundreds of Little Things Which So Often Clutter Up the House

A Camouflaged Sewing Room: At First Glance One might be Led to Believe That This Is a China Cupboard or Buffet. However, the Lady of the House Knows Better, and could, If She Chose, Disclose the Interior of a Well Arranged, Though Somewhat Large, Sewing Cabinet, by Pulling the Panels Down and Outward, from the Top, into the Lowered Position Shown at the Right

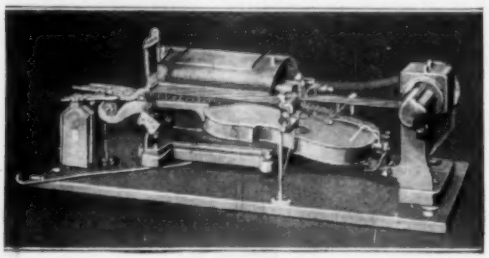
## GROUP-CONTROL METHOD OF PLAYING VIOLINS

Essentially different from anything in the nature of an automatic musical instrument is a new group-control violin



Console by Means of Which One Musician Plays Any Number of Violins: Electrical Control Is by the Switches above the Keyboard and by the Three Pedals

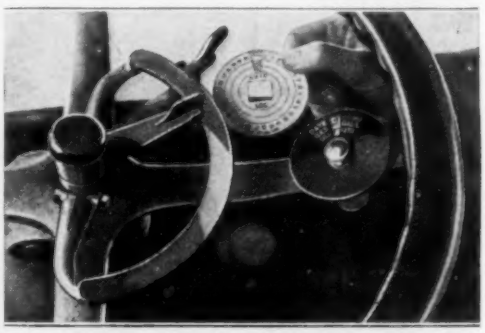
player that was recently demonstrated in Chicago, as the first-violin basis of an orchestra of 30 pieces. The new instrument, singly or in groups, is played from the keyboard of a console by means of which the musician's fingers do exactly the same things—and more of them—that are done by a violinist with the instrument in his hand. Moreover, from one keyboard one performer can play any number of violins. Each violin is a complete unit, and is mounted on a stand that is connected with the console by an electric cable controlled by a switch. A small motor on the violin stand rotates four celluloid disks—one to each string—that take the place of the ordinary bow, but do what that can never do, because they can play all four strings at once. Under the strings, instead of over them, are the fingers that are electrically controlled by the keyboard and by switches on the console, enabling the performer to get all the usual bowing effects. Further control is by means of three pedals, one piano, one forte, and the other for playing progressively, or simultaneously, on any number of violins desired, when there are more than one connected to the console.



Violin That is Played Electrically from a Console at Any Distance: At the Right Is the Motor That Rotates the Bow Disks. At the Left Are the Mechanical Fingers

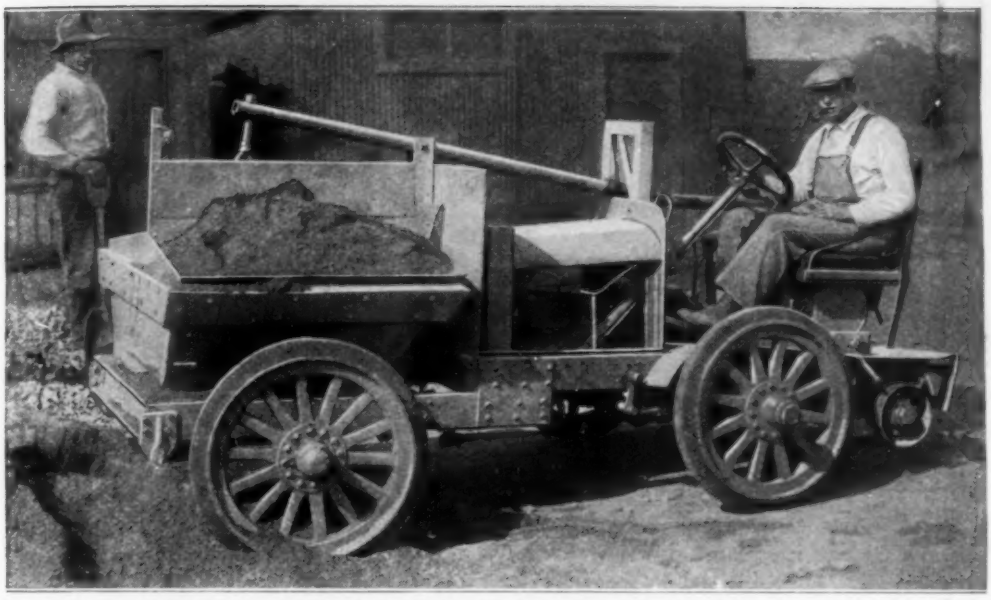
## ACCESSORY HELPS MOTORIST TO KEEP DAILY RECORD

Motorists who wish to keep a handy record of the daily expense and mileage of their cars, can do so with the use of an accessory recently placed on the market. The accessory has a paper disk divided into 31 parts, representing the days of the month. The miles traveled, and any purchases of gasoline or oil, are recorded upon the disk, which is revolved to the proper date by turning a thumbscrew on the top. At the end of the month, a complete record is found on the card of the total expenditures, and the mileage.



Removing the Disk from the Daily Recording Accessory to Ascertain the Month's Expenditures for Gasoline and Oil, and Miles Traveled

¶ At Port Etienne, in the French West African colonies, the center of a growing fishing industry, a former French cruiser has been anchored in the bay and turned into a fish-drying factory. Sixty tons of fish can be dried on its decks at one time.



One of the Auto-Wheelbarrows Designed for Paving Work in Long Beach, California, Which have Proved Economical of Both Time and Labor: They are Built on Standard Light Motor-Truck Chassis and are Equipped with a Hopper and Dumping Mechanism

## AUTO-WHEELBARROW IS LATEST TYPE OF DUMPING TRUCK

Auto-wheelbarrows, designed by a contracting firm, are really miniature dumping trucks with a new arrangement of their parts. The machine is built on a light-truck chassis, with the driver's seat at the rear, back of the wheels. The engine is placed between the front and rear wheels, and the hopper is in front of the engine, directly over the front wheels. The dumping mechanism is operated by means of a lever. These machines have a much greater capacity than the ordinary wheelbarrow and have proved economical of both time and labor. They are used for carrying materials to concrete mixers, and the load can be dumped directly into the mixer skip.

## CAFETERIA IN YOSEMITE PARK POPULAR WITH TOURISTS

The first cafeteria ever established in a national park was operated last season in Yosemite Park. It proved so successful that others will probably be established in national parks throughout the country. Its purpose was to supply meals to park employes, about half the patrons, and to tourists and campers, at the lowest possible cost. In five months 250,000 meals were served at an average cost of about 48 cents each.

## A SIXTEEN-SHOT REVOLVER MADE IN BELGIUM

A Belgian concern is manufacturing a revolver which enables the user to fire 16 bullets without reloading. The arm has two barrels, one above the other, registering with two series of eight holes each in the cartridge chamber. It is fitted with a double firing pin, and the bullets are fired alternately from the inner and outer circles. When all the cartridges have been discharged, the empty shells are thrown out all together by pressure

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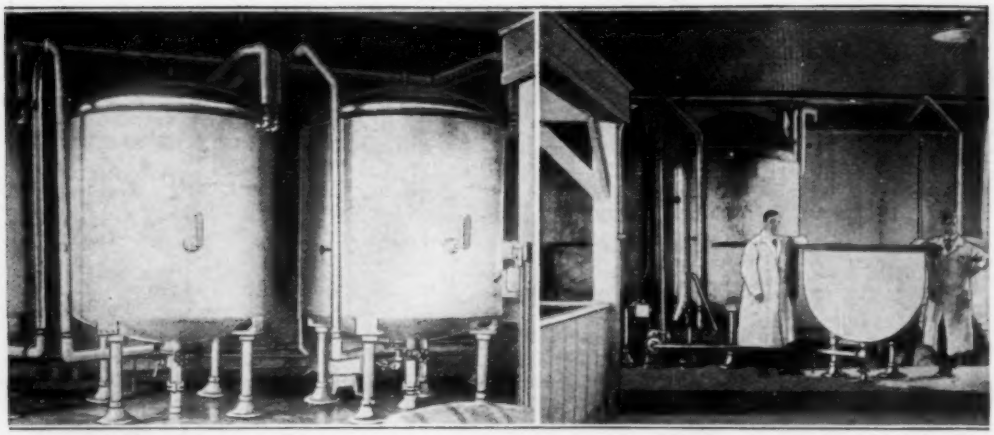
The 16-Shot Revolver Broken, to Show the Arrangement of the Two Circles of Cartridge Chambers

on an ejector rod. The caliber of the gun is .32. A similar type of arm fires 20 bullets without reloading, but is of somewhat smaller caliber.

¶ We want all our readers to write us freely and often whenever they wish additional information on articles published in this magazine. Address Bureau of Information, Popular Mechanics, Chicago.



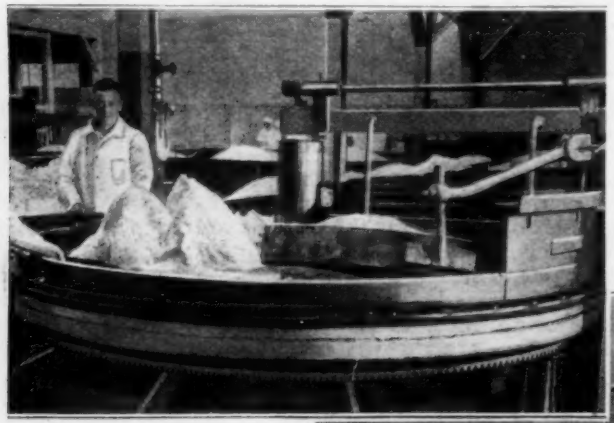
Glass-Lined Preparation Tanks, in Which Coconut Oil is Alternately Heated and Cooled, the First Step in Making Coconut-Oil "Butter," are Shown at the Left. The Pump and Pipe, at the Right, Used in Filling the Tanks, are Taken Apart and Cleaned Immediately after being Used

# HOW COCONUT-OIL BUTTER IS MANUFACTURED

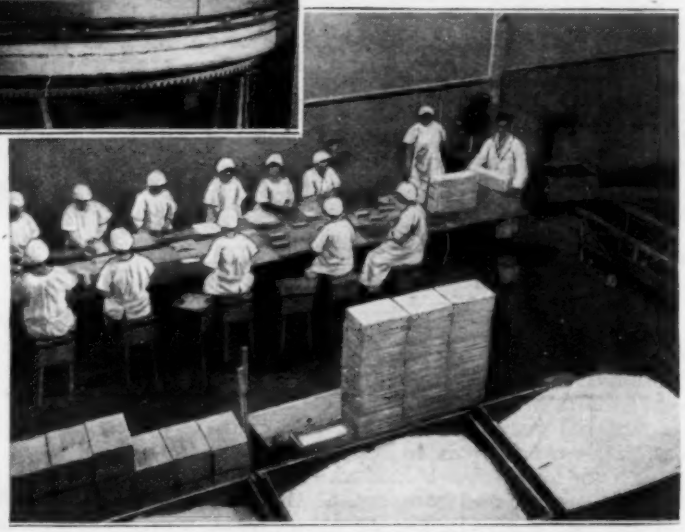
By C. W. GEIGER

THOSE not interested in the manufacture of butter from coconut oil have probably forgotten that the price of the natural product has advanced considerably in the last few years. In view of present conditions, the growing use of this substitute is worth the attention of every sufferer from the expensive habit of eating food. As a matter of fact, producers in Germany and France learned several years ago that coconut oil made edible butter as well as good candles and soap; so they worked out secret formulas by which they have manufactured the butter by the thousands of tons. In the United States the process is of more recent introduction, but is now conducted quite profitably on the western coast, where the "copra," or dried coconut meat, is received directly from the islands of the South Pacific.

San Francisco is thus the home of the factory illustrated on these pages, and considered to be one of the most efficient in the United States. This

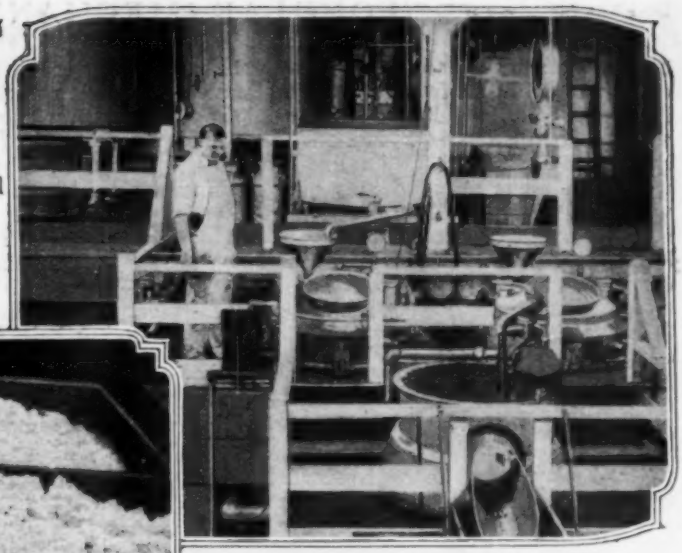


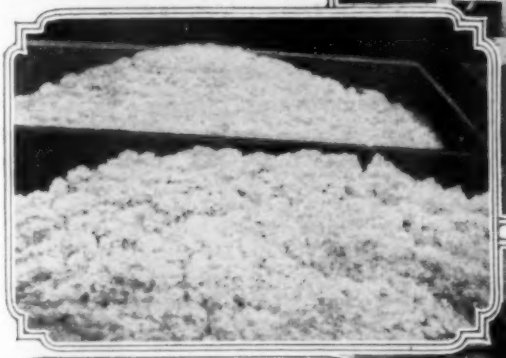
On This Revolving Kneading Table, Excess Water is Forced Out of the Mass of Crystallized Oil, and Salt is Worked into It



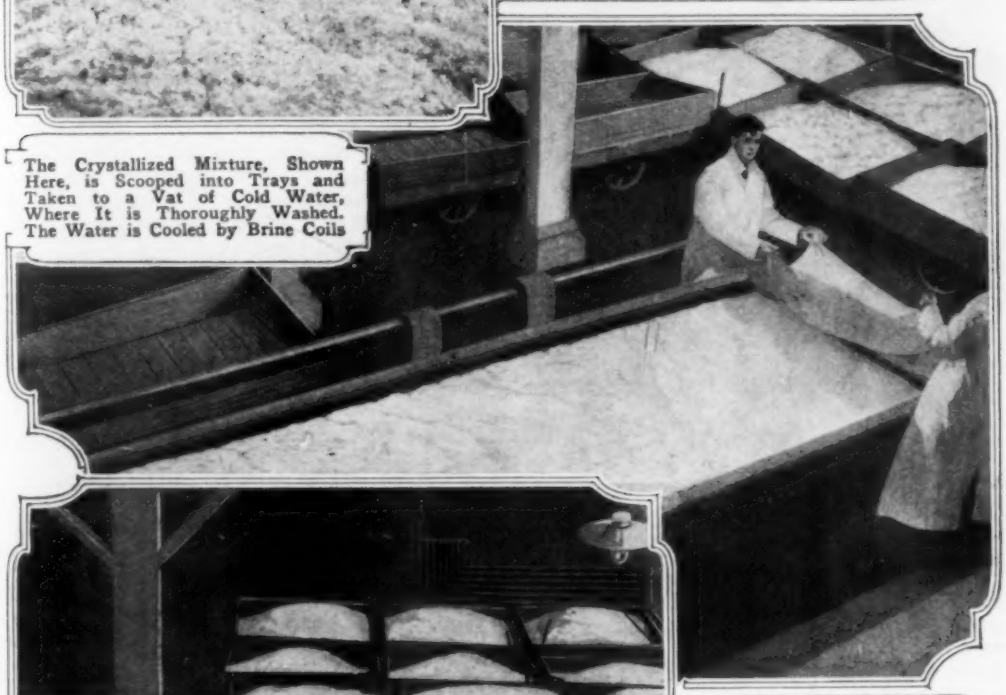
After being Cut into One-Pound Bricks, the Finished "Butter" is Placed on an Endless Belt Which Moves down the Center of a Wrapping Table. Girls, Sitting along the Table, Pick the Bricks from the Belt and Wrap Them

From the Preparation Tanks the Oil is Pumped into Churns and Mixed with Milk. The Man is Standing beside the Churns. The Mixture is Pumped into the Centrifugally Operated Glass-Lined Crystallizer, in the Foreground, Where It Forms Crystals





The Crystallized Mixture, Shown Here, is Scooped into Trays and Taken to a Vat of Cold Water, Where It is Thoroughly Washed. The Water is Cooled by Brine Coils



After the Crystals have been Washed in the 20-Foot Vat, Which is Shown Above, Two Men Again Scoop Them into Trays, Mounted on Wheels, and They are Taken to a Room, Where They are Allowed to Stand from 20 to 26 Hours

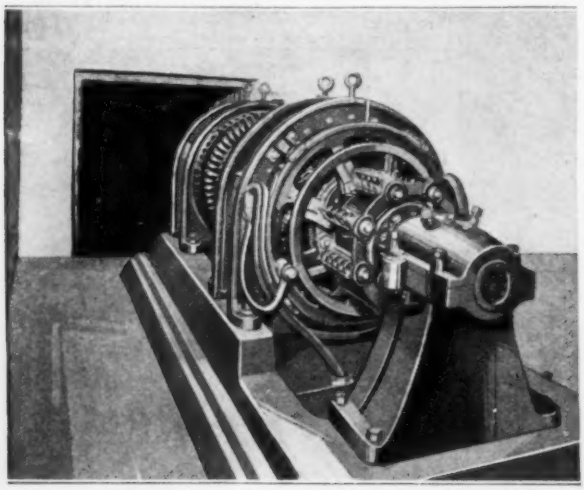
While Standing in the Trays, the Crystals become "Tempered" and Take On the Aroma of Butter. They are Then Taken to the Kneading Table for Final Preparation

concern is unusual, too, in pressing out the oil at its own mill, from which the heavy, ill-smelling liquid is hauled in special tank wagons to the factory. Here it is stored in great glass-lined tanks until needed, when the oil is pumped into preparation vats, also glass-lined, in which it is alternately heated and cooled by steam and brine pipes. Then comes treatment in churns where 30 per cent of milk is added, this mixture passing into a "crystallizer" where contact with cold water converts it into solid "crystals."

Scooped into trays, these crystals are then set out for 20 to 26 hours, permitting the butter aroma to penetrate thoroughly. At the end of this period the crystals are placed on a broad table where rollers and knives knead them into appetizing butter, pressing out excess water and working in the salt. To permit handling, the butter is then hardened in a freezing room; later cut into the one-pound portions of commerce, and finally placed on a wide, moving belt, from which it is seized and wrapped by quick-fingered girls.

## AUTOMATIC SUBSTATION IN AMERICAN COAL MINE

Far back under the coal-veined hills at Nanty Glo, Pa., a powerful substation keeps steadily at work without the presence of any attendant. It is located two miles from the drift mouth and occupies a most substantial apartment. The walls are of heavy masonry with steel beams for ceiling. A 2,200-volt cable comes from the surface through a bore hole.

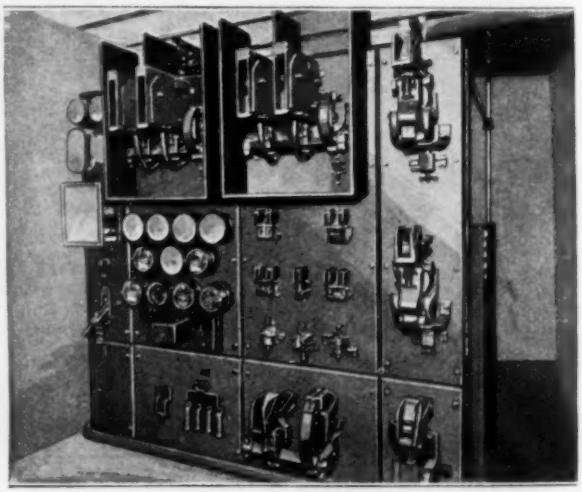


Motor-Generator Set at Automatic Substation in a Coal Mine at Nanty Glo, Pennsylvania: Without the Presence of an Engineer It is Perfectly Protected against Overload, Hot Bearings, or Overspeed

The substation is in many respects superhuman, for the motor-generator set is protected against overload, short circuit, hot bearings, reverse current, and overspeed to a degree that even the most efficient attendant could not approach.

If power is interrupted on the central-station lines, the substation will automatically shut down. In like manner whenever the power comes on, the substation will automatically resume operation instantly and pick up the mine load. Thus power conditions at the load centers are greatly bettered, consumption of power is trimmed down, and the service of attendants is made unnecessary. The first day's operation of the station showed an increased production of 200 tons.

This motor-generator set operates in parallel with engine-driven generators in the power plant near the drift mouth. The compounding of the motor-generator set is so designed as to throw the maximum load on the power plant. Thus the motor-generator



Switchboard in Power Plant near Drift Mouth That Controls the Motor-Generator Set at Automatic Substation Located Two Miles Away

set acts as a booster. It takes off the peak loads and reduces the purchased-power consumption to a minimum.

In general it may be said that with automatic substations installed, it is entirely practicable and feasible to start and stop any number of generator sets with the aid of remote control either from the mine office or from any other convenient point. In the case of the station here in question, the starting and stopping of the set is simply effected by means of a push button located in the engine room of the power plant.

This Map Shows Fort Wayne as an Indian Village and Frontier Fort

Another Step in Its Development to a Thriving Industrial Community: In 1854 It Occupied a Considerable Territory South of the River

## WALL-SIZE MAPS SHOW GROWTH OF CITY

An interesting and unusual method of visualizing the growth of a city has been worked out by B. J. Griswold, of Fort Wayne, Ind. A series of wall-high maps graphically demonstrate the growth of the city by contrasting various stages in its development from the days when it was a little Indian settlement with a fort, established by Anthony Wayne, at the juncture of the St. Mary and St. Joseph rivers, down to the present time. Mr. Griswold recently delivered lectures, which were well attended, to the Chamber of Commerce, to joint assemblies, the city's business clubs, and gatherings of school children. The maps depict in detail the various steps in the city's growth.

In 1921: Lectures, Graphically Illustrated in This Way, Proved Equally Interesting to the Chamber of Commerce, Civic Organizations, and School Children

## NOVEL METHOD DEMONSTRATES QUALITY OF LINOLEUM

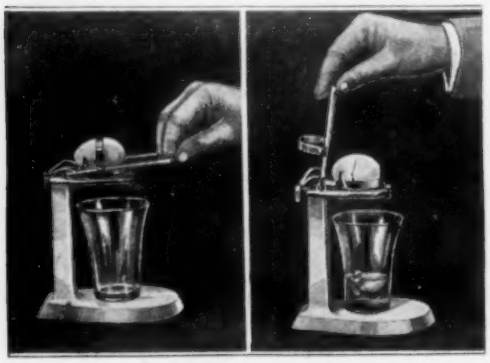
Advertising of a most convincing sort was recently adopted by a dealer in house furnishings who wished to demonstrate

Linoleum, Covering the Sidewalk in Front of a Store, was Given a Severe Test of Its Wearing Quality, Where All might See and be Convinced

the wearing qualities of his floor linoleum. On the sidewalk in front of his store, he laid a strip of the linoleum with the price per yard, and a request to the public to "watch it wear" printed on it. The way in which the sample stood the unusually hard wear and the constant exposure to the weather was an effective demonstration of quality.

## EGG OPENER NEW SANITARY DEVICE FOR KITCHENS

Sanitary handling of eggs, in restaurants, hotels, and soda fountains, is made possible by a new egg-opening device. It consists of an enameled frame, in which a glass is placed. Over the glass is a cradle to hold the egg. By lowering a handle, a saddle strap is pressed down on the egg, forcing two fine points through the shell. Lifting the handle draws the points apart, separating the shell into two pieces and allowing the contents to drop into the glass. All metal parts are made of an alloy which is not affected by the sulphur in the eggs.



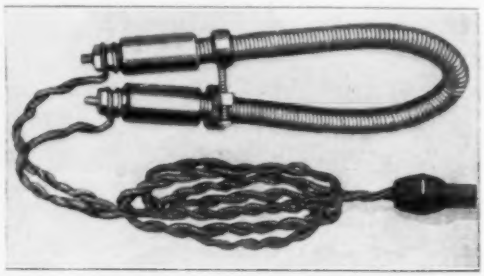
The Egg, Resting in the Cradle, is Pressed Down, as Shown at the Left. When the Handle is Raised, as at the Right, the Shell is Drawn Open

## RUSTLESS PLASTIC STEEL NOW MADE IN ENGLAND

Steel that is both rustless and plastic has been produced at Sheffield, Eng. It has perfect rust-resisting properties, and can be stamped, punched, pressed, or engraved cold. When bent cold to a radius equal to its thickness, it shows no sign of fracture. It will retain a silver-bright polish in any atmosphere. Articles have been made of this steel that have the same strength as if made of brass or nickel, and only about half the weight.

## ELECTRIC MANIFOLD HEATER WARMS "COLD" ENGINES

An easily attached electric intake-manifold heater of recent development will be appreciated by those who have to crank a "cold" engine. The heater is connected to the storage battery by means of a socket mounted on the dashboard of the



The Manifold Heater, with the Cord and Plug Attachment for Connecting to the Storage-Battery Socket on the Dashboard

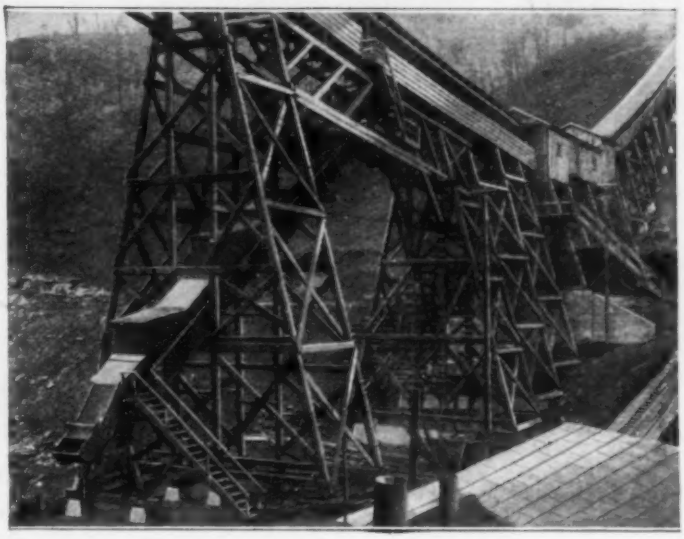
car, and is simply wrapped around the intake manifold, where it is operated for two to five minutes before the engine is started.

## ONE TIPPLE SERVES TWO MINES THROUGH LONG CONVEYOR

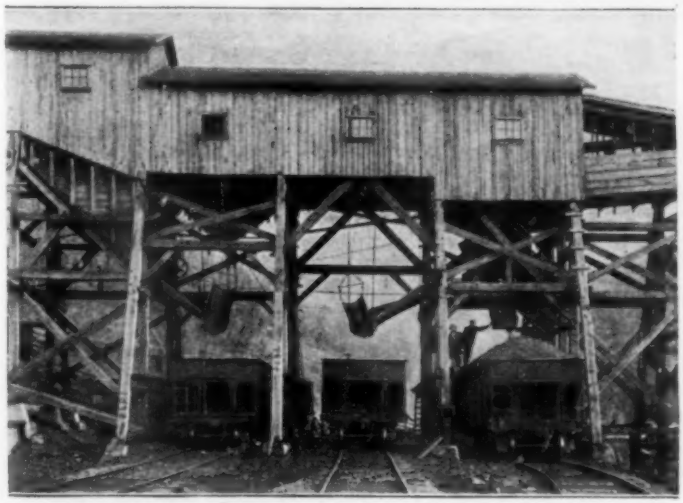
In Fayette County, West Virginia, where two coal mines, opening on opposite hills, are served by a single tipple in the valley below, a conveyor is used which is probably the longest of its kind in the world. One side is 1,070 ft. long and drops 458 ft., while the other is

Long Conveyors Carry the Coal, from Mines on Opposite Hilltops, to a Common Tipple, on a Railroad in the Valley Lying between the Hills

1,125 ft. long and drops 470 ft. The cable-and-button-type conveyor consists of a 1¼-in. cable with 12-in. transversal iron disks bolted to it at 4-ft. intervals. The cable runs through a wooden trough, with a ¼-in. steel bottom plate, the disks serving to carry the coal along. Steel prongs distribute the coal over the cables in such a way that the lumps rest on the slack. The friction of the slack keeps



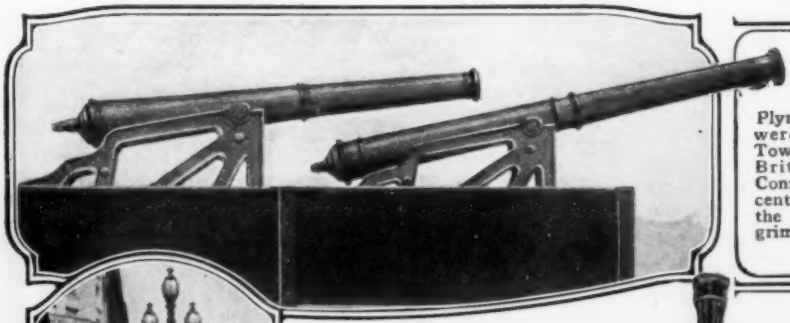
The Conveyor Trestles Consist of Towers and Trusses Built of Timbers Which were Shipped Ready-Cut and Numbered



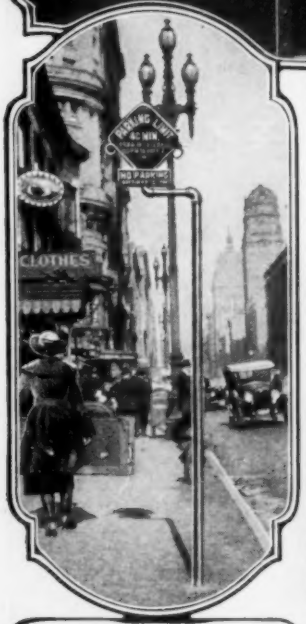
The Tipple Where Coal from the Two Mines is Dumped into the Waiting Cars: Though One Tipple Serves Both Mines, Their Coal does Not Mingle

the conveyor from running away, and the lumps cannot grind the trough. A device connected with the driving gears acts as an automatic brake. The pull of the conveyor applies the brake if the belt breaks or the power fails, and prevents the danger of the conveyor, with its 50-ton load of coal, getting beyond control. Impurities, such as slate, are picked from the coal as it passes down the troughs, and are thrown into chutes emptying onto the hillsides.

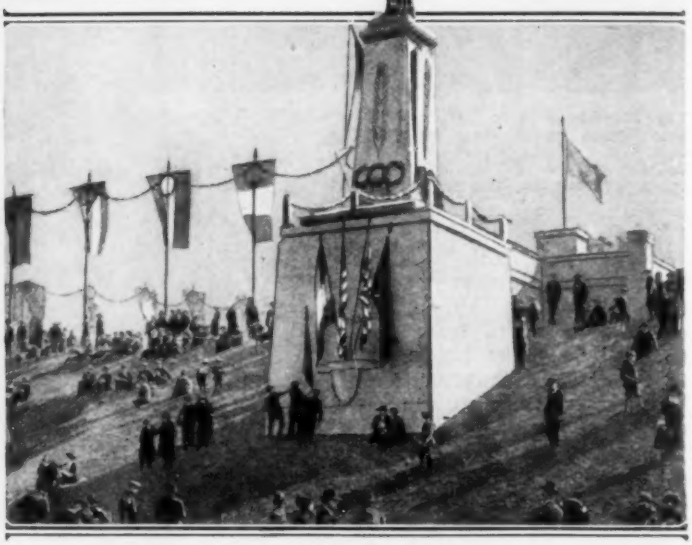
# CIVIC FEATURES THAT PROMOTE THE COMFORT



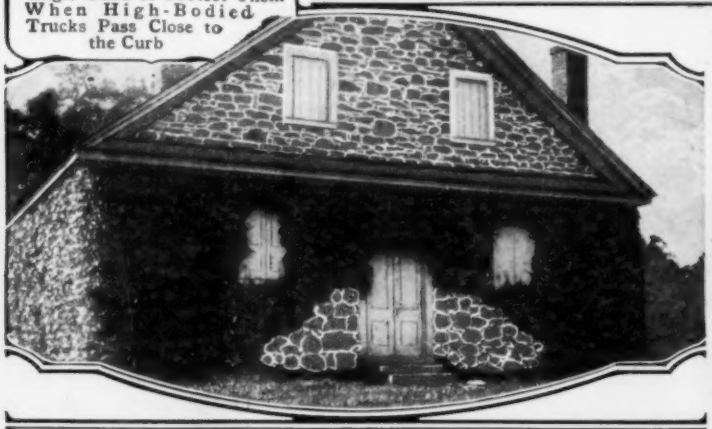
Two Sixteenth-Century Cannon, Similar to Those Mounted on the First Fort at Plymouth, Massachusetts, were Presented to the Town of Plymouth by the British Government, in Connection with the Tercentenary Celebration of the Landing of the Pilgrims, and were Placed at Plymouth Rock




Parking-Restriction Signs, Erected by the California State Automobile Association in the Downtown District of San Francisco, Have a Right-Angle Bend to Protect Them When High-Bodied Trucks Pass Close to the Curb



Dedication of the Kansas City, Missouri, War Memorial, during the 1921 American Legion Convention: In the Torch, at the Top, the "Flame of Inspiration" was Lighted, and Representatives of England, France, Belgium, Italy, and the United States Decorated It with Wreaths

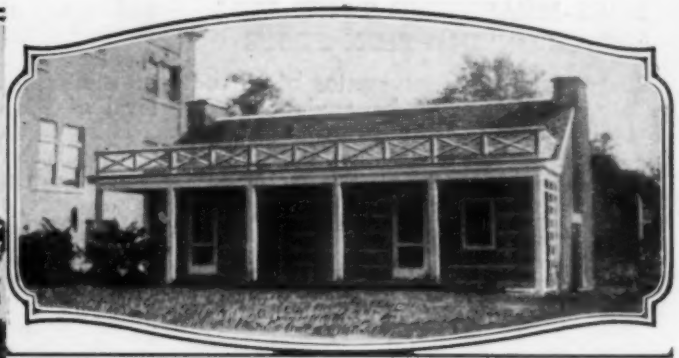


This Picturesque Old Church, Built in 1769, Stands near Wellsville, Pennsylvania. In a Century and a Half, There have been Held in It Only about as Many Regular Services as Other Churches Have in a Year. Because It Is Not Easily Accessible, Services are Held Only on the Fourth Sunday of Each September

Trees Planted by the "Tree Club" of Ottawa, Illinois, Said to Be the First Organization Formed to Plant Soldiers' Memorial Trees, are Protected by Signs. A Bronze Tablet will be Placed on Each Tree, Bearing the Record of the Dead Soldier in Whose Honor It was Planted

The trees around this boulevard were planted by the Civic Clubs of Salt Lake for its beautification. The Kiwanis Club will pay $25.00 reward for the arrest and conviction of anyone damaging them.

One of a Number of Signboards Placed along the Boulevards of Salt Lake City, Utah, by Civic Clubs, to Protect Trees, Which They have Planted along These Boulevards, against Vandals



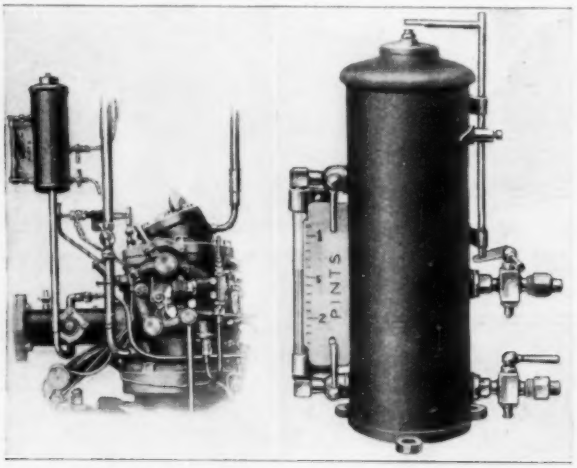
Built in 1826, This "Old Log Courthouse," in Independence, Missouri, a Suburb of Kansas City, is Still Used. It has been Repaired Somewhat, but Still Shows the Bullet Scars of Indian Days

"King Fisher," a Hunting and Fishing Camp on the Cedar River in the Mountains near Seattle, Washington: It was Built, 26 Years Ago, by Harry Watson, a Seattle Sportsman, as a Place Where All Sportsmen would Be Welcome to Camp and Only be Expected to Leave the Place as They Found It

Street-Car Terminal at the Presidio, San Francisco: Beside the Platform and Shelter, There Is a Building Containing a News Stand, Restaurant, Telephone Booths, and Shoe-Shining Stand

## FUEL-MEASURING TANK AIDS OIL-CONSUMPTION TESTS

Tests of the fuel consumption of oil and gasoline engines may be made quickly, and at any time, by the use of an automatic fuel-measuring tank being manufactured in England. This tank is fixed in the fuel-supply line, well above the level of the carburetor or fuel-injection pump, preferably near the main fuel tank and below it. A float-operated valve, at the top, allows the escape and entrance of air when the tank is filling or the engine is running, and also controls, automatically and accurately, the amount of fuel admitted. Fuel enters the tank from the supply pipe through a cock and passes out to the engine through another cock. Both cocks are always open except when making a test. To make a test, the cock at the supply pipe is closed, and at the end of a fixed time the cock to the engine is also closed. The consumption can then be read on the scale opposite the oil level in the glass gauge. This scale is calibrated in pints.




Left: The Fuel-Measuring Tank, as It Appears Mounted in the Engine-Supply Line, Above the Level of the Carburetor. Right: The Tank Enlarged to Show Its Construction

## BELL WARNS TRUCKS LOADED TOO HIGH TO PASS DOOR

To warn drivers when their trucks are loaded too high to pass through the doorways of express terminals, boards are being hung from the ceiling, at the height of the entrance. A load that is too high, strikes the board and rings a small warning bell. This device is also used in front of elevator shafts, and is said to prevent many accidents to persons and much damage to shipments.

This Load Is Too High to Pass through the Doorway, but a Warning is Given by a Bell When the Load Strikes the Board in Front of the Door, So That the Truck may be Stopped and the Load Properly Adjusted to Avoid Any Possible Damage to It

## MAMMOTH PUMP HAS CAPACITY OF 40,000,000 GALLONS

An addition was recently installed at the Louisville, Ky., waterworks, consisting of a mammoth pumping engine, the capacity of which is 40,000,000 gal. every 24 hours. This vast amount of water is rather beyond comprehension, but may be found easier of conception by remembering that the average daily consumption of water per person in Louisville, is estimated at 107 gal. Not all the water pumped is delivered through the mains for consumption, as approximately 20 per cent is used for washing the various filters. Thus out of the total amount pumped, only about 32,000,000 gal. would be delivered, which, however, is enough to supply a population of 299,065 at that rate.

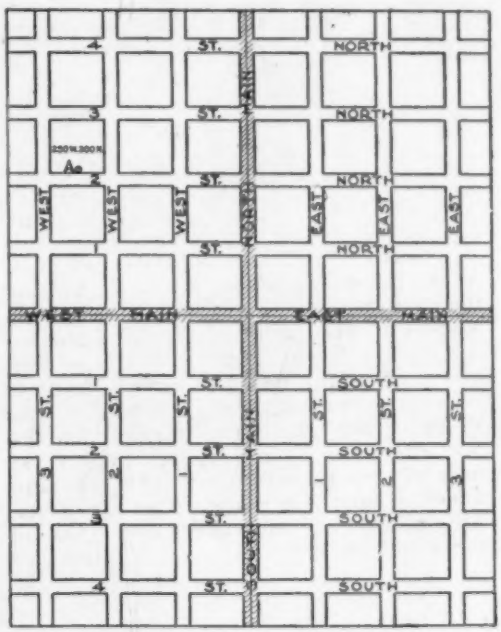
Lifeboat-Releasing Gear Operated by a Lever at the Bottom of the Boat Which Turns a Pipe That Pulls Down a Rod and Unlocks the Hooks So That They Are Overturned, as Seen Clearly by Hook at the Right

## LIFEBOAT-RELEASING GEAR ACTS AS SAFETY DEVICE

Safety devices for the release of lifeboats when lowered from a ship's davits have taken many forms. One that looks simpler than most has been recently invented. A pipe supported along the bottom of the boat just above the keel has at each end a small crank that operates a vertically disposed rod on the end of which is a roller that locks the hook at each end of the boat by engaging its shank. The hook is pivoted on a support connected to the boat in such a manner that when the shank is left free, the hook is automatically overturned, releasing the boat from the davit falls. The unlocking is done by giving the pipe a half turn with a lever that is connected to it at any convenient point at the bottom of the boat.

## SIMPLE LOCATION SYSTEM FOR CITY STREETS

Application has been made for a patent upon a system of locating streets, residences, and other points in cities, which is similar to the method of locating points by latitude and longitude. The city is quartered by two main division streets. All enumerations begin at these division streets, 100 numbers being allowed to each block, and even numbers are used on the right side of the street, odd numbers on the left. To locate any building, its street number is given first, followed by a letter indicating its direction from the division street. This is followed by a number and letter indicating the distance and direction, from the division street, of the street on which the building is situated. Supposing that a person inquires for the location of some building, and is told that it is at 1225 E. 400 S., he knows immediately that it is in the southeast quarter of the city, 12¼ blocks east of the division street running north and south, and on the left side of a street four blocks south of the division street running east and west.



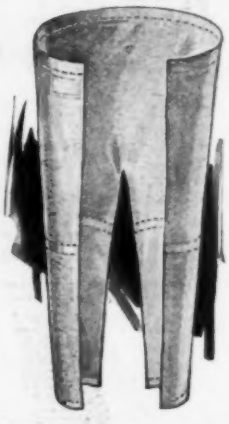

A in the Plat is Indicated by 250 W. 200 N., in Other Words, It Is Two and One-Half Blocks West of North Main Street and Two Blocks North of West Main Street

# SOME NOVEL AND LITTLE-KNOWN ACCESSORIES

This Needle Case Holds Five Different Sizes. The Top is Turned to the Desired Size and the Needle Drops Out of a Small Hole

This Sewing Pin is Used by Fastening the Long End at the Sewer's Knee and Allowing the Projecting Short End to Hold the Material being Hemmed

A Baby's Collapsible Bathtub over Which is Adjusted a Dressing Table Having a Safety Belt Attached to Prevent the Child from Rolling Off



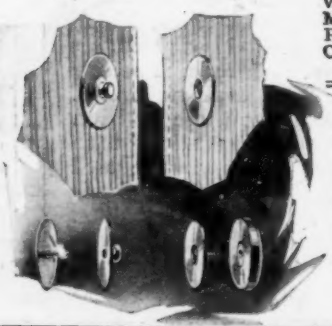
A Garment for Car Owners Which can be Put On or Taken Off in Four Seconds without being Pulled over Dirty Shoes: It is Held in Place by Flexible Steel Bands

A Medical Thermometer Which does Not Require the Usual Vigorous Shaking: Slight Pressure on the Top Brings the Mercury Down in One Second

This Electrically Heated Pad for Earache is Shaped to Fit over or behind the Ear and is Kept in Place by Bands Fastened around the Head

A Combined Vanity and Watch Case with Silver Mesh Chain Has Coin and Powder Holders, Card Clip, and Writing Pad

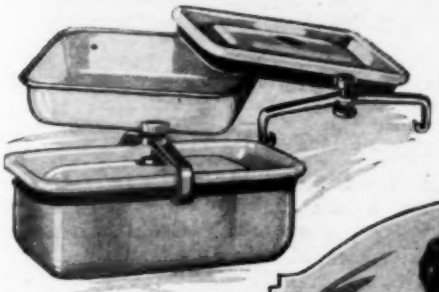
An Electric Hot Plate Which can be Used As a Toaster, or As a Heating Element for the Various Professions



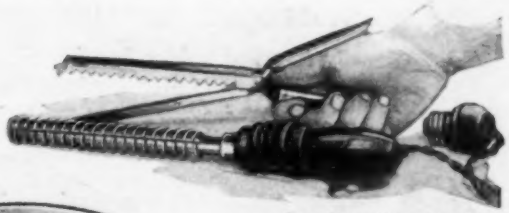
This Snap Fastener can be Attached to Any Material without Sewing. The Screw Point Pierces the Goods and the Other Half Fastens on It. The Combined Parts Then Snap Together



*Anyone wishing further information on devices described in the editorial pages can*



This Container Is Valuable for Storing Food or Liquids of All Kinds, Because It Is Water and Air-Tight, and Is Especially Useful in Hospitals for Holding Sterilized Instruments or Gauze



For Marcelling the Hair, the Lower Instrument is Electrically Heated and Thrust into the Hair. The Upper Instrument is Then Tightly Squeezed over the Hair Surrounding the Heated Part

A Telephone-Slug Holder, with Which the Subscriber Always Has the Necessary Means Handy to Operate the Telephone in Case of Emergency Instead of Frantically Searching for a Nickel

With the Use of This Necktie Press the Wrinkles can be Taken Out of the Necktie Overnight

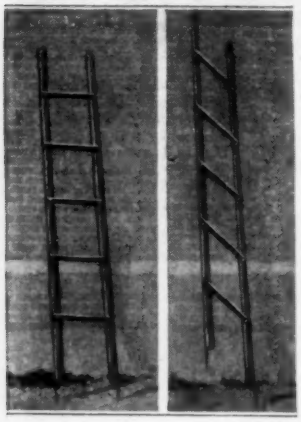
A Rubber Boot without a Heel, So That It can be Worn by School Children over Their Shoes in Snow or Slushy Weather: The Boot Folds into a Small Container When Not in Use

This Is a Highly Ornamental Table with a White-Porcelain Top Which can be Folded Out of the Way When Not in Use, Thus Saving Space in Modern Kitchens

Flexible Cuff Links will be Appreciated by Those Having Occasion to Do Dirty Work While Wearing Clean Cuffs. Instead of Soiling Clean Linen in Removing the Ordinary Link to Push Up the Sleeve, the Flexible Link Yields without being Unfastened

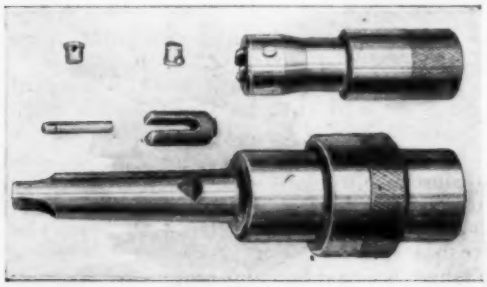
## LADDER FOR FIGHTING CHIMNEY FIRES DEVISED BY FIREMEN

A light, easily handled ladder for fighting roof and chimney fires has been devised by members of the Brunswick, Me., fire department and is attracting much attention among firemen in New England. It consists of two wooden, 2 by 3-in. side-pieces, with rungs of heavy strap iron and strong spikes at the lower ends. The rungs are fastened with a single bolt at each end so that the ladder may be collapsed when not in use. It can be carried anywhere by one man, and the spikes, biting into the roof, hold it firmly in place.



## SOFT SHEARING PIN IS USED IN QUICK-CHANGE CHUCK

Combining a soft shearing pin with a quick-change chuck is an innovation that will be noted with great interest by those who have occasion to use a drill press of any kind. The chuck is made to hold ordinary drills with tapered shanks, and has a safety arrangement which prevents the breaking, or "burning," of drills, taps, reamers, counterbores, etc. The safety method lies in the insertion of a soft-steel pin into the jaws of the chuck, where it is held in place by a setscrew. In the event of the drill, or other tool, being overstrained, which would break, or burn it, the soft pin is sheared off, thus saving the tool from injury. By loosening the setscrew, the sheared pin can be removed, and a new one inserted.



Top: Two Views of Ejector and Collet. Center: The Soft Shearing Pin and Jaws. Bottom: The Assembled Quick-Change Chuck

## SEA-WATER ICE IS USED FOR PACKING FISH

An innovation in the fish industry of France is the making of ice from sea water, by a process which eliminates the concentration of salt, that usually occurs when brine or salt water freezes. This "salt ice" performs the double service of keeping the fish cold, and also of "salting down" the fish as a means of preserving them. In recent experiments conducted with this ice, it has proved far superior to the ordinary fresh-water ice, both in cooling and in preserving qualities.

## "STEPPING ON THE GAS" AIDED BY USE OF AIR CYLINDER

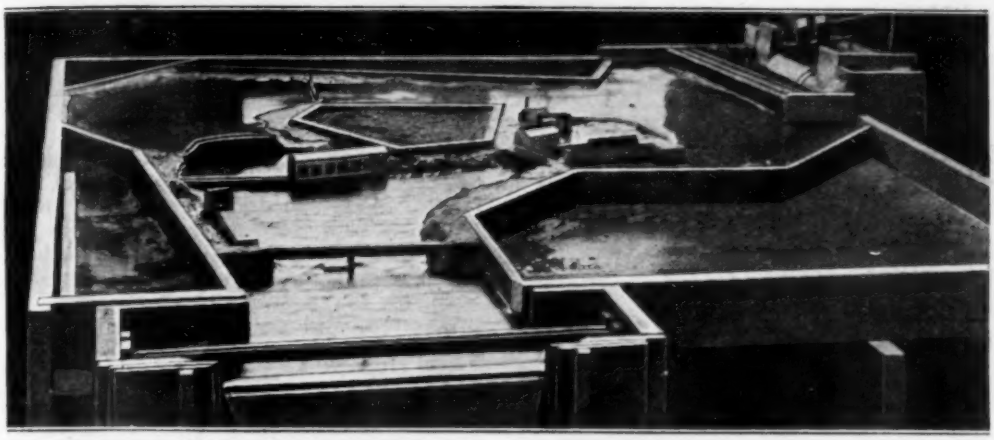
An air cylinder attached to a pedal placed over the accelerator is a new automobile accessory now being manufactured in the East. It is claimed that the appliance eliminates any "fluttering" of the throttle caused by driving over rough roads or shifting of gears. In this manner the even running of the motor is assured.

## EMPLOYES CONTEST TO BOOST PLANT-SAFETY INSPECTORS

Employes of a large manufacturing concern, with several plants, have reduced accidents to a remarkably low figure in their effort to raise their own plant-safety inspectors above others on the company's monthly chart. This chart shows a comparison of hours lost, due to accidents, with total hours worked in each plant, by columns of varying height. The smaller the percentage of loss, the higher is the column. In each column are printed the name of the plant, percentage of loss, number of hours lost, and number of accidents for the year and month.

# MODEL BUILT TO STUDY WATER-POWER PROBLEMS

By SAM E. CONNER



Model of a River and Contemplated Power Plant Made to Exact Measurements from Careful Surveys So That It Was an Identical Miniature Duplicate of the Originals: Tests were Conducted by Allowing Water to Flow through the River of the Model under Conditions Found in the Real River

ENGINEERS called upon to install a hydroelectric power plant on the Kennebec River, Me., in the town of Skowhegan, found themselves confronted with a serious problem. The place where the plant and dams must be located, was in the center of the town, with valuable property all around it. It was necessary, in order that the power desired be obtained, to change the existing water head from a range of 12 to 18 ft. to a constant head of 32 ft., and at the same time the dams must be so constructed that, besides caring for a normal flow of 3,600 cu. ft. per second with the 32-ft. head, they would handle, with equal facility, a flood-time flow of 150,000 cu. ft. per second to protect the surrounding property from damage by freshets on the river.

To add to the difficulties of the engineers, the falls, at the point where the power plant was to be built, were divided by a large island in such a way that the falls of the river's south channel were nearly 1,000 ft. farther down the river than those of the north channel, which were of horseshoe shape.

In order that they might be certain of their plans, the engineers made a model of the river bottom, banks, dams, power station, and other buildings in close proximity to the place. This was made to exact measurements from careful surveys, so that it was an absolute duplicate of the river and power plant in miniature. It was then tested by permitting water to flow through the river of the model under conditions as nearly like those which were to be met at various times on the real waterway, as could be provided. These results were such that the engineers felt they were right, but determined upon a further test which they thought would be a final stamp of approval.

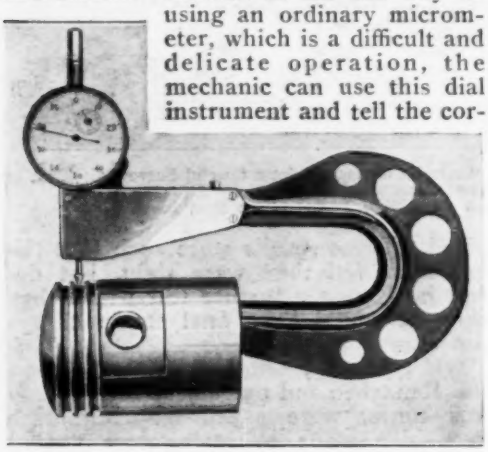
Old rivermen, who had driven logs on the Kennebec and over these falls countless times, were called in. Miniature logs—also made to scale—were floated through the model. Each time before the logs were started on the river, the rivermen were asked to designate the starting point and to tell what, on the main river, in actual work, the logs ought to do. They were also asked into what eddies they should float, and how they should strike the sluices. Acting upon the rivermen's information, it was found that the miniature logs traveled exactly where predicted in every instance, thus demonstrating the accuracy with which the model was built, and also the correctness of the plan for the installation.

The power plant will have a present installation of three 3,000-hp. units, with provision made for a fourth, and will be located upon the south fall. As the bulk of flood water must be handled at the north dam it was necessary to provide exceptional facilities for letting through the freshet pitch. This has been accomplished by flashboards, hinged to the top of the middle section of the dam, each one being 7½ ft. high. These are operated by men sent out in a basket on a cable over the dam. When the boards are lifted, a toggle joint on the downstream side falls into place, securely fastening the boards. To release them the men reach down upon the upstream

side with a hook, catch the trigger which releases the joint, and the board falls. The north section of this dam is equipped with flashboards, 11 ft. high, of the raising and lowering type, while at the south end have been installed two radial 32 by 17-ft. gates, having a capacity to discharge 7,500 cu. ft. of water per second. This north dam is 475 ft. in length and built of solid concrete reinforced with steel.

## DIAL MICROMETERS ARE USED TO MEASURE PISTON GROOVES

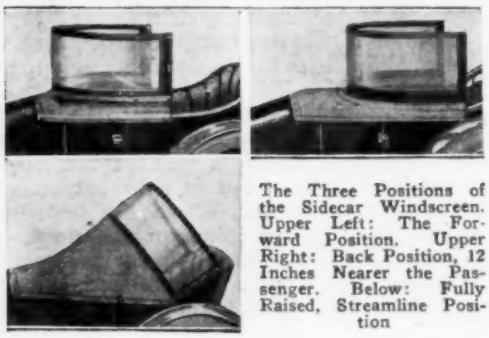
The depth of piston-ring grooves can be rapidly measured with a new dial micrometer. Instead of the old way of using an ordinary micrometer, which is a difficult and delicate operation, the mechanic can use this dial instrument and tell the correct thickness at first glance. The dial has two hands on it, one large and one small. The small hand is used solely to record the number of revolutions made by the large hand, so that the total is quickly seen.



With the Handle, Seen Above the Dial, the Point is Raised or Lowered and the Depth of the Piston-Ring Groove is Indicated by the Dial

## STREAMLINE WINDSCREEN MADE FOR MOTORCYCLE SIDECARS

A windscreen for motorcycle sidecars, which has been used with great satisfaction in England for some time, has just made its appearance in this country. A flexible, transparent panel is mounted in a steel frame. To the bottom of the frame is attached a waterproof twill apron. This screen is adjustable by means of wingnuts. When fully raised, it deflects all air, rain, or snow over the head of the passenger, giving absolute protection, and decreases the air resistance of the car.



The Three Positions of the Sidecar Windscreen. Upper Left: The Forward Position. Upper Right: Back Position, 12 Inches Nearer the Passenger. Below: Fully Raised, Streamline Position

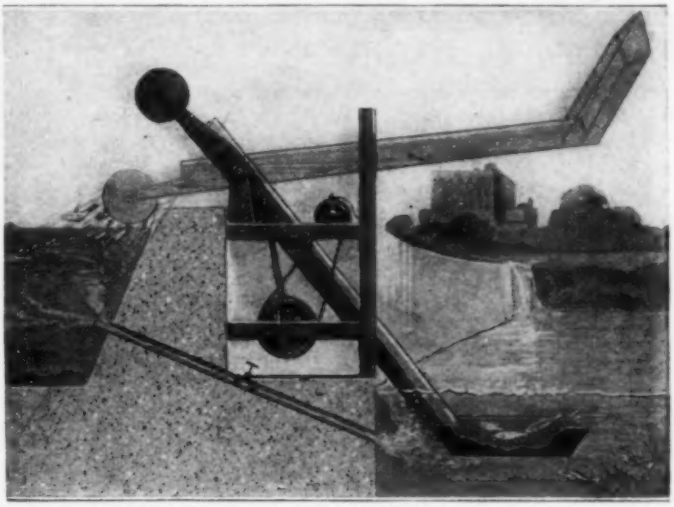
## SPECIAL BUREAU ESTABLISHED IN MINNEAPOLIS POST OFFICE

In the post office at Minneapolis, Minn., there is a special bureau which is the novel and highly successful attempt of Postmaster Purdy to assist foreigners. Many foreigners, who could not speak English, and were accustomed to going to government offices for everything in their native countries, applied for help in reading or writing addresses, making customs declarations, and filling out all sorts of papers, and also made use of the money-order and postal-savings services. An "Information Bureau" was established, "information" being one of the first English words a foreigner learns to recognize. A survey was made of the 1,155 employes in the post office to learn what foreign languages each could speak or read. Whenever a foreigner applies for service, an interpreter is called from the staff. Every dialect of Europe is represented in the post office, and the only languages employes have failed to interpret are Chinese and Japanese. Besides assisting foreigners, the Information Bureau is called upon to answer all kinds of questions, especially by automobile tourists. It keeps on hand road maps, time tables, lists of resorts, and many other kinds of information. Because of his success with this bureau and other innovations, Postmaster Purdy was summoned to Washington by Postmaster-General Hays, to tell him and other postmasters how to do it.

¶ Popular Mechanics Magazine does not publish the name of the maker or seller of any device described in its pages, but this information is kept on file and will be furnished, free, by addressing our Bureau of Information.

## NOVEL FORM OF ELEVATOR LIFTS FISH OVER A DAM

A dam in a river is often an obstacle that prevents fish from going up the river to spawn. Where it is desirable that the fish should spawn in the part of the river above the dam, a means has been devised by a fisherman of Massachusetts for lifting the fish over this obstacle. The contrivance is in the nature of an elevator in the form of a counterbalanced beam that is pivoted on trunnions rotating in supports at the top of the dam, and extends downward from this pivot far enough to reach the water below the dam, the end of the beam above the pivot extending to a convenient length for the attachment of a counterweight. To the end at the lower water level is connected a metal scoop, large enough to hold several fish. From this scoop, along the whole length of the upper surface of the beam, there is an outlet pipe, so that when the scoop is raised a little above the horizontal by swinging the beam on its pivot, the water and the fish in the scoop run down the pipe and are discharged into the river above the dam. The elevator is operated by a system of gears driven by an electric motor. The fish are attracted to the vicinity of the scoop by a disturbance of the water caused by the discharge from a water pipe that penetrates the dam. It is expected that this means of helping fish over a dam during the spawning season will be found superior to the customary fishway or ladder. It has the added advantage of wasting no water.



Elevator for Lifting Fish over a Dam When Going Upstream to Spawn: Elevator is Shown, Dark, Catching the Fish in Its Scoop, and, Light, in Its Raised Position Discharging the Fish into the River above the Dam

## TWO-SHELL GARBAGE CAN DISINFECTS REFUSE

Anything leaking from an ordinary garbage can spreads on the ground, and becomes a breeding place for flies and a culture bed for bacteria. This defect is remedied by a two-shell container that is now being made in Kentucky. The inner shell is the garbage can, and the outer one catches any leakage there may be, and contains a germicide.

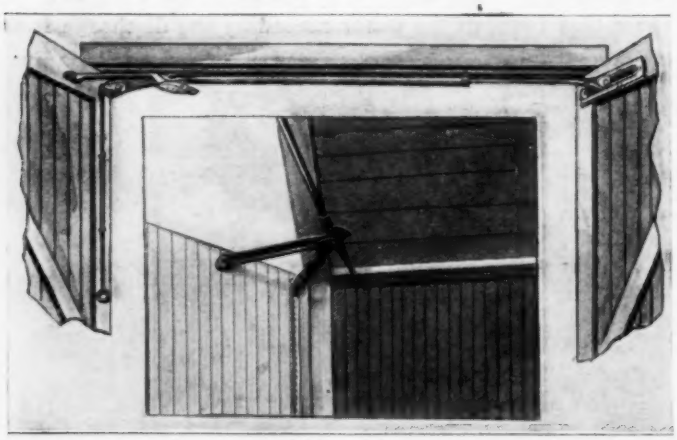
## SMOKESTACK WRECKED BY NEW METHOD IN 55 MINUTES

Five workmen recently brought a 148-ft. smokestack to the ground in 55 minutes, by a new method. This stack, on Staten Island, N. Y., measured 47 ft. in diameter at the base and weighed 350 tons. Three openings were made at the base, and wooden blocks, 4 ft. high and 4 in. in diameter, were inserted as shorings. A gap, 4 ft. high, was then made in more than half of the circumference by removing the bricks. Two of the shoring blocks were removed and the center block, soaked with kerosene, was burned out. The stack crashed with such force that some of the bricks were buried 2 ft. in the ground, but most of them remained intact and can be used again.

¶ Our Bureau of Information will answer all questions regarding articles appearing in this magazine.

## DOUBLE SWING DOORS LOCKED IN ANY OPEN POSITION

While entering or leaving a garage, one of the swing doors is likely to be blown to a partly closed position, often damaging a car while passing it. To make this impossible, a control has been devised that securely locks the doors in any open position. It consists of a pair of rods in connection with two brackets, each of which is fastened to the top of one of the doors. At one end of the rods is a toggle arrangement with two arms, one of which has a segmental end perforated with holes by means of which the toggle can be adjusted to hold the doors locked at any desired angle of opening. A pull on a chain releases the toggle so that the door can be closed and locked again.

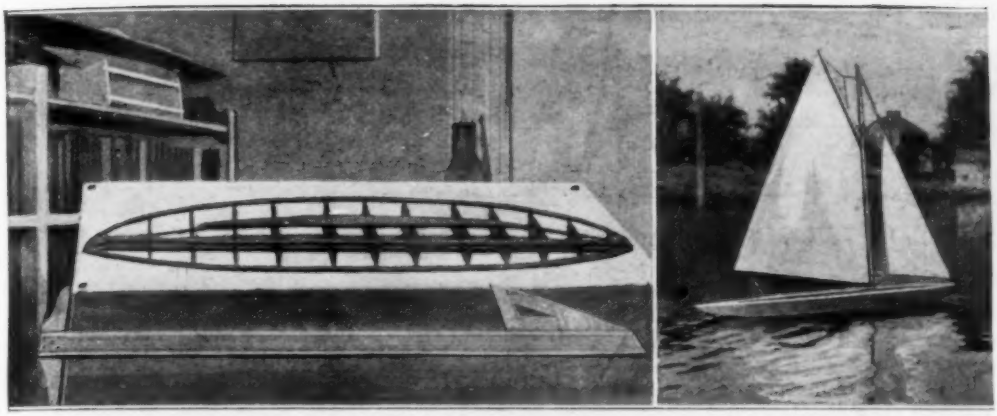


Above: Outside View of Garage Doors Open and in Locked Position; by Pulling the Chain on the Left-Hand Door the Lock is Released and the Doors can be Closed. Inset: View from Inside of Garage Looking Up at the Locking Toggle

PHOTO BY GILLIAMS SERVICE

### FARMING FISH IS ODD OCCUPATION OF SOUTH SEA ISLANDERS

ALTHOUGH the word farming is usually associated with the cultivating of land and the sowing of grain, the South Sea islanders have a method which is quite different. Instead of planting grain and harvesting crops, they catch fish and place them in inclosed bodies of water, to be harvested at the owner's pleasure. The fish are obtained from shallow lagoons, caused by the formation of coral walls, which surround these islands, and are left in the "farms" until an opportunity offers to sell or barter them for other necessities.



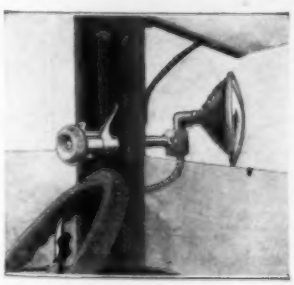
Left: Framework of Boat Made Entirely of Strips of Heavy Paper and Shellac Held Together with Glue, Shown on an Ordinary Drawing Board. It Is the Same Length as the 42-Inch T-Square beneath It. Right: The Paper Boat Finished and Rigged, Seen in Full Sail on the Water

## HULL OF SAILING-BOAT MODEL MADE ENTIRELY OF PAPER

More different kinds of material can be used in connection with boat building than in almost any other form of structure. Boats have been built of every kind of wood, of every kind of metal, of stone and of concrete, and even of paper. A model of such a boat has a hull 42 in. long, 6 in. wide, and with a draft of 7 in., made entirely of paper and shellac, finished with several coats of oil paint and spar varnish. Frame, sheathing, deck, and keel are all made up from paper held together with glue, and the only metal used was 1½ lb. of lead required for ballast. It is a sailing boat, with the spars of pine. Its total weight is 2 lb. 13¼ oz. The boat is now nearly three years old, and though it has been sailed a great deal, it is just as good as new.

## AUTO SPOTLIGHT AND CONTROL FOR CLOSED OR OPEN CARS

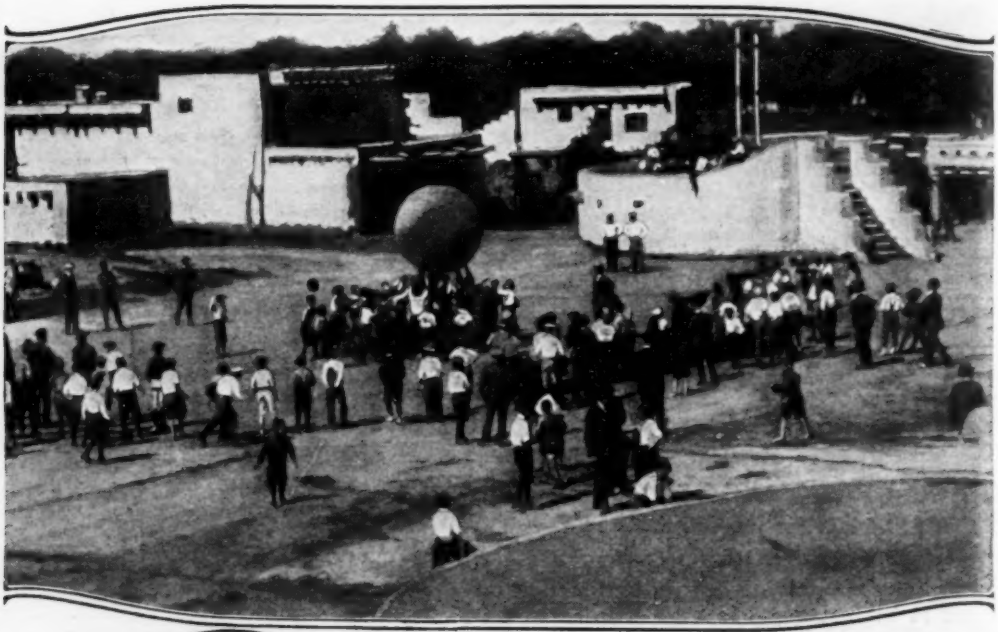
Though specially designed for use on closed cars a new spotlight and control is equally suitable for any style of automobile. On open cars it is attached to the windshield by means of a bracket. To install it on a closed car, a ¾-in. hole is bored through the corner post of the car, and the control housing is passed through this hole. A knob on the control handle, inside the car, is turned to move the lamp to the right or left horizontally. When a release key is pressed, turning the knob moves the lamp with a circular motion, throwing the light in any direction desired. The lamp may be locked in any position.



## TRAFFIC DIRECTOR CANNOT BE DAMAGED BY ACCIDENTS

A new traffic director is made of a one-piece metal casting and is practically indestructible, besides having other characteristics that recommend it. It is 22 in. high, 18 in. wide, and weighs 250 lb. When placed in the street, it leaves a clearance of 12 in. to the street-car tracks on each side. It is so made that it is self-righting when tipped over, will not spin if struck a glancing blow, and cannot be moved far if hit directly. It is not affected by weather.

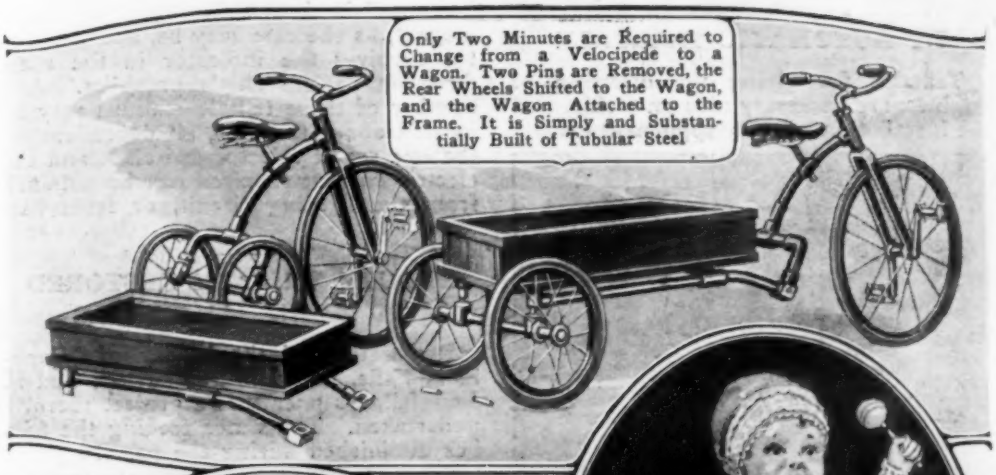
¶Plans have been made for extensions of many of the existing subways in London, Eng., for the linking up of others, and for enlarging the oldest one sufficiently to accommodate the present subway rolling stock. This enterprise involves new capital to the amount of 30 to 40 million dollars.



When Doctor George J. Fisher, Deputy Chief Scout Executive, Visited the Boy Scouts of San Diego, California, He Found This Novel Headquarters, an Indian Village Which was Saved from the Panama-California Exposition and Presented to the Scouts by the City. This Push-Ball Game Was Part of the Program Given for Doctor Fisher

A Kiddie Car with a Sidecar: There Is Always Something New to Please the Children, and the Most Popular Toys Are Those That Are "Just Like Big Folks Have." With This Outfit the Youngster can Take His Favorite Doll, Woolly Dog, or Other Pet, for Company When He Goes Riding

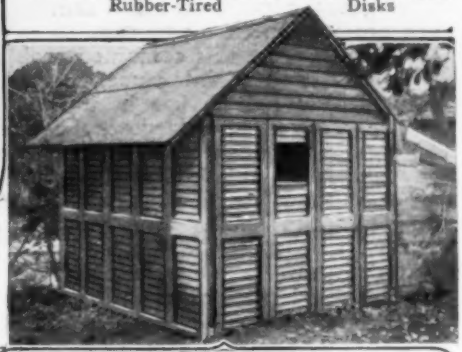
When Andrew J. Abell, Jr., Left San Francisco on Horseback He Had Four Companions, but He Was the Only One to Reach Washington, District of Columbia, after a 5,926-Mile Ride. His Dog, "Trix," Rode Back of the Saddle, and Was Probably the First Dog to Make Such a Trip and to Meet the Governors of 29 States. Young Abell, Who Is 18 Years Old, Obtained the Autographs of All the Governors along His Route



Only Two Minutes are Required to Change from a Velocipede to a Wagon. Two Pins are Removed, the Rear Wheels Shifted to the Wagon, and the Wagon Attached to the Frame. It is Simply and Substantially Built of Tubular Steel

A Padded Iron Ring Surrounds and Supports the Child, and the Front Props Keep the Vehicle from Tipping Over. The Straddle Seat Is Just High Enough to Allow Baby's Feet to Touch the Floor, and He Learns to Walk in a Natural Way. The Rear Wheels Are Specially Designed Rubber-Tired Disks

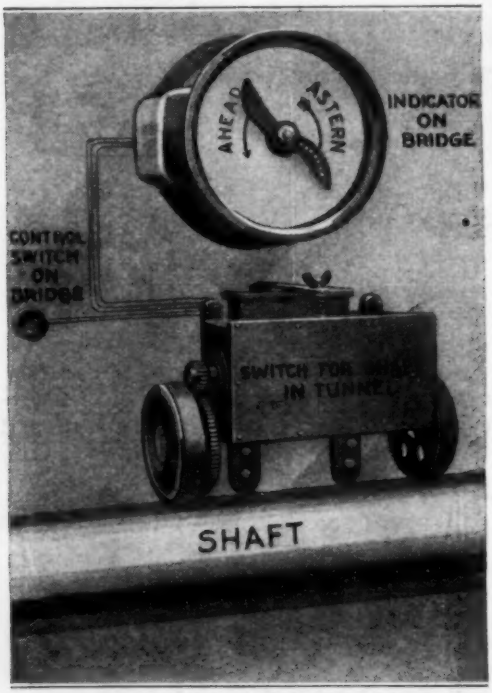
Here Is a New Sort of "Pep" Testing Machine, Invented by a Physical-Culture Expert of Boston, Massachusetts. The Person to be Tested Stands under the Suspended Platform and Jumps Straight Up into the Air, Pushing the Platform Up. At It Moves, It Registers the Height of the Jump



This Six by Eight-Foot Library, Built Almost Entirely of Old-Fashioned Green Shutters, Is the Business Undertaking of Two Schoolboys, in the Suburbs of Kalamazoo, Michigan. They Started a Year Ago with 50 Books and Now Have About a Thousand, Which They Lend for One Cent Each

## ENGINE DIRECTION IS SHOWN BY AUTOMATIC TELLTALE

Telltales for giving the direction of engines, are necessary aids on a ship, and the installation of these appliances usually




**The Ahead and Astern Indicator Electrically Connected to the Inclosed Switches, Which are Controlled by the Wheels Resting on the Shaft**

proves to be quite expensive, especially if the ship is driven by high-speed turbines. With turbines, costly reduction gears have to be placed on the driveshaft, and these gears require close attention if they are to function properly.

As a relief from this combined problem of expense and maintenance, an automatic electric telltale has been brought out by a firm in Glasgow, Scotland. The new instrument has two selector switches placed at the driveshaft, which are controlled by two small wheels, turned by the shaft. The wheels are arranged so that one will close a switch when the shaft revolves in the "ahead" direction, and the other will close a switch when the shaft revolves in the "reverse" direction. The switches, in turn, control a distant electric motor and two electromagnets. The magnets represent the two respective wheels on the driveshaft, and are operated when the selector switches are closed. An indicator, having driving gears for "ahead" and "reverse," is thrown into gear by either magnet, as the case may be, and the motor revolves the indicator in the same direction as the ship's propeller. Any number of these telltale stations may be located about the ship, all dependent on the one set of selector switches, and the electric current required can be obtained from the lighting circuit, or from batteries.

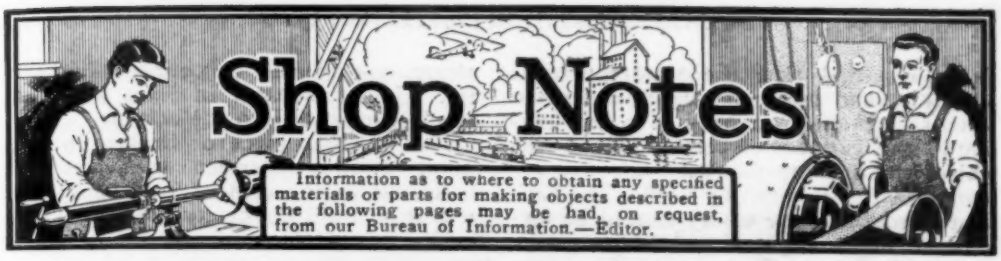
## BEAUTY WILL BE RESTORED TO MINNEHAHA FALLS

Restoration of the beauty of Minnehaha Falls, famed in Indian lore and in Longfellow's poems, is a project recently undertaken. The water feeding the falls has diminished during the past 10 years, until this beauty spot possesses only remnants of its former grandeur. A reservoir is planned at Rice Lake, which would empty into Minnehaha Creek and thence over the falls.

## STEEL CHIP 166 FEET LONG TURNED OUT ON LATHE

What was probably the longest steel chip on record, measuring 166 ft., was turned out not long ago on a 30-in. lathe, operating on a machine-steel forging for turbine-shaft sleeves. The unusual length of this chip was credited to the clever workmanship of the operator in handling the lathe, to good tools, and the high quality of the material.

**Steel Chips, Curling off Lathe Work, Are a Common Sight, but Few Approach the Length of This One, Which Probably Holds the Record**


Shop Notes
Information as to where to obtain any specified materials or parts for making objects described in the following pages may be had, on request, from our Bureau of Information.—Editor.

# How to Save Decayed Trees

By A. H. SCOTT

DURING recent years, the art of tree surgery has made great strides, owing, in part, to the attention drawn to the problem of preserving our fast-disappearing supply of lumber.

The secret of successful tree surgery lies in the prevention of any possible contact of water with the woody fiber of the tree, and it is just in this one point that the uninstructed man fails. By following the directions given here, an aged and decayed tree may be given a further period of life and its beauty preserved as part of the landscape.

At the Left, the Cavity Cleaned, Braced, and Ready for Filling; at the Right, the Cavity Filled, Showing How the Cement is Laid in Sections and Smoothed Off So That the Growing Bark can Push Easily across the New Surface

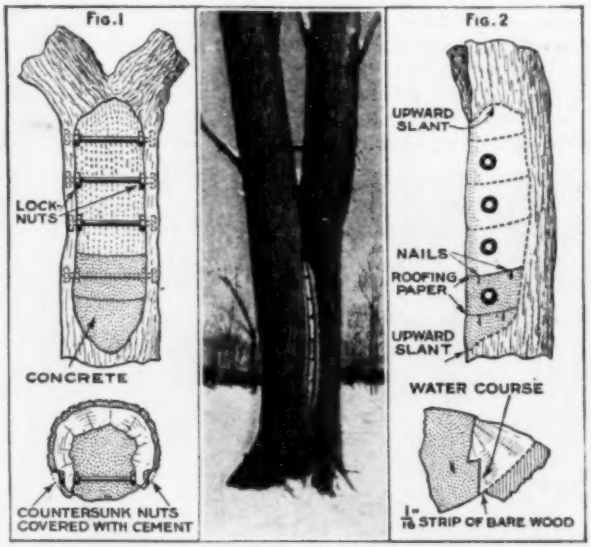
The tools needed are: a 2 or 3-lb. mallet, a heavy 2-in. gouge, and a 1-in. and a 1½-in. chisel; the necessary materials: cement, sand, disinfecting solution, coal tar, burlap, and bolts, together with some miscellaneous material that will be mentioned later.

Using the gouge, the rotten matter should be cleaned out, right down to the sound wood. This usually means enlarging the cavity to several times the original size, but it is absolutely necessary that none of the rotten brown particles be left to form a new nucleus of decay. Care must be taken that the bark is not loosened when cutting around the edges of the cavity; this is best done by striking the first blow with the gouge slanted inward, then drawing it away from the edge. Having thoroughly cleaned the cavity, the margin should be smoothed off to a continuous line as indicated in the various views.

The top of the cavity is undercut, and the bottom slanted upward, as shown in Fig. 2. The sides should be leveled off with a flat chisel before cutting the watercourse; this is designed to drain off any water that might enter the sides of the cavity, and should be from ¾ to 1 in. wide and extend the full length of the cavity. It is cut to a depth of from ⅜ to ½ in.

It is essential that the watercourse is clean-cut and level, so that it will drain even the smallest quantity of water finding its way between cement and wood; the chisel and a sharp-pointed knife will accomplish this if carefully used. The bark at the edges of the cavity should be leveled off at an angle of 45°, and a ⅛-in. strip of bark cut off all around the cavity, exposing the bare wood, as shown in Fig. 2. This strip, the beveled edge of the bark, and the watercourse are quickly painted over with any heavy paint at hand, to prevent drying of the bark.

The sides of the cavity are then braced by ¾-in. bolts, spaced 12 to 14 in. apart, as shown in Fig. 1; ¾-in. iron rods, threaded at both ends and fitted with four nuts, are best for this purpose, the holes being bored with an extension bit. The outer nuts should be countersunk into the tree, and each countersink treated exactly as though it were a miniature cavity. The entire cavity should now be thoroughly disinfected with a solution made by dissolving bichloride-of-mercury tablets (poison) in denatured alcohol, one tablet to each quart. When the cavity is dry, it is given a coat of hot coal tar, which is best applied with a long brush, nailed to a stick. The tar must be kept out of the watercourse.




Left, Method of Bracing and Filling in Concrete; Right, How the Cavity is Cut and the Sections Divided; Center, Cavity Extending into Crotch. Note the Bolt between the Two Main Branches

The cement, in the proportion of three shovelfuls of sand to one of cement, is now prepared, using only enough water to bring the mixture to such a consistency that a ball of it, when squeezed in the hand, will retain its shape. Mark a point halfway between the bottom of the cavity and the first bolt, nail on a piece of burlap, completely inclosing this portion, and fill in the cement, tamping it in thoroughly. Smooth off the top of the cement, slanting it upward toward the back, and over it place two layers of roofing paper, cut to the contour of the cavity. Hold this paper in place with nails stuck through it into the cement.

Nail another piece of burlap up to a point midway between the next two bolts, fill in the cement, and repeat the operation until the cavity is filled. If the cavity is a shallow one, nails or spikes should be driven into the sides to assist in holding the cement. Pull off the lower burlap and smooth off the cement, continuing upward as the cement sets. A small mason's trowel and molder's slick make the best tools for this purpose. The cement surface should meet the ⅛-in. strip accurately, to enable the bark to grow over the cement easily. The countersinks are then filled in and smoothed off; the roofing paper can be trimmed close when the cement is hard.

If the cavity extends up into the crotch of the tree, the main branches should be tied with a strong rope, to prevent the tree from splitting until the bolts are in place. In this case, these branches should be permanently chained together slightly more than halfway to the top of the tree, and bolts put through just above the crotch, if the tree is large.

The growth of new wood over the cement may be doubled in speed if the edge of the past year's growth is slightly skinned with a knife each spring, and once during the early part of the summer. This causes the bark to reach out instead of curling under, especially if the surface of the filling is rough.

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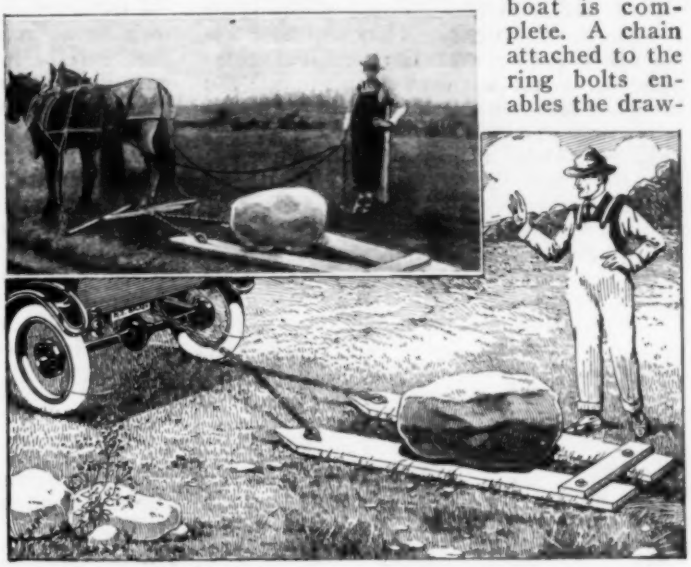
### Locating a Keyhole in the Dark

The insertion of keys into keyholes and the location of doorknobs, in the darkness, are simplified if the surface about the keyhole and knob is coated with luminous paint.

### An Improved Stone Boat

For building garden walls, stone fences, laying foundations, or similar masonry work that requires the transportation of heavy stones or other weighty masses, the old stone boat can well be resorted to. The farmer perhaps appreciates the utility of this "vehicle" better than anyone, and he knows that it is easier to move heavy objects horizontally than vertically. However, the stone boat that is now helping the settlers of cut-over lands to avoid the dangers of hernia and strained backs in the clearing of their land, is built along different lines from the old type.



A Stone Boat for Moving Heavy Bowlders or Tree Stumps: This Type of Boat Itself Lifts the Load, Thus Relieving the Operator of Much Heavy Work and Clearing the Land More Rapidly

Large weights that are to be moved by a stone boat are usually dragged by a team of horses, yet one man can pull a surprisingly heavy object with it, and two men can make quite a showing; if handled carefully, a light car can also furnish the pulling power without undue strain.

The making of a stone boat of the type illustrated requires only two pieces of plank, about 8 ft. long, a wooden crosspiece, two straight bolts, and two ring bolts, together with the necessary length of chain. The planks are pointed at one end, and the two squared ends are bolted to the crosspiece, which should be of about 2 by 8-in. stuff and less than 2 ft. long. A space of several inches is left between the planks at the crosspiece, to permit the rear ends to move together when pull is applied to the forward ends. On fastening the ring bolts to the front end, about 1 ft. from the point, the stone boat is complete. A chain attached to the ring bolts enables the draw-bar pull to be applied at a convenient distance from the pointed ends of the planks.

This particular type of stone boat works like a pair of scissors. Placed behind a stump or bowlder, it opens up as the pulling power forces its two pointed planks apart. As the pull is steadily applied the load is lifted or rolled onto the stone boat and then hauled away. Where a team, or other pulling power, is available the operator has no work except to adjust the pointed planks and the chain—this stone boat loads itself.—Mark G. Troxell, Madison, Wis.

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### Making Gun Greases

During the war, the deterioration of arms and equipment of different kinds from rusting was a serious matter, and the government spent much time and money in extensive experiments upon "slushing oils" for the prevention of rust. As a result of this work, the following formulas were developed and gave excellent results:

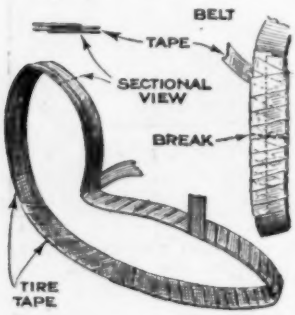
Resin (preferably H-grade) 1 part, vaseline 10 parts, and kerosene 1 part. The resin is melted and mixed with the previously heated vaseline. The mixture is stirred well while cooling, and then the kerosene is added. If a more solid grease is desired, a little candelilla wax may be substituted for a part of the vaseline. The more wax used, the more solid will be the resulting grease. In government tests, this mixture almost perfectly preserved bright-steel plates that were exposed to outside winter weather for eight months.

Two other formulas are given for semi-solid greases, as follows: Formula A; candelilla wax 3 parts, resin (preferably, but not necessarily, H-grade) 6 parts, and vaseline 50 parts; Formula B; 2 parts

carnauba wax, 5 parts resin, and 50 parts vaseline. The materials in the above formulas should be heated together to about 250° F., until all the ingredients are melted, and the mixture thoroughly stirred while cooling. They are best applied so as to cover the surfaces completely. When it is desired to remove the grease, slightly warm the article protected by it, and wipe off with a clean cotton cloth.—Chas. E. Mullin, Philadelphia, Pa.

### An Emergency Fan Belt

In an emergency, when a fan belt breaks or is lost, a serviceable substitute, that will hold until the proper kind of belt can be obtained, can be made from tire tape.




Such a belt is made by looping about four layers of tape to make an endless ring of the proper diameter. Each layer is slightly staggered as in the sectional view. A diagonal wrapping in each direction is then applied for further strength. Under some conditions, when the belt is not lost, it can be repaired with tape strips.

### Roller for Decorators' Stencils

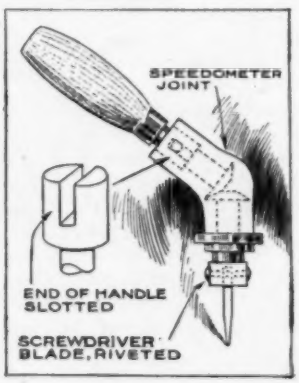
Nearly all stencil brushes will tear the ties and fine lines of complicated decorators' stencils and patterns. To overcome this, I make use of a tool that works faster and gives better results than the brush, and saves the stencil. A wooden roller, about 3 in. in diameter, has a slot, ½ in. deep, cut parallel with its center. The roller is covered with a piece of plush or felt, preferably the former, about an inch longer than the circumference of the roller, the excess material being forced into the slot and tacked to hold it in place. Pins are driven into the ends of the roller, and a handle is made from stiff wire and bent over the pins. The paint, or calcimine, is spread on a board, or slab, and the roller is run over this until the plush or felt covering is sufficiently charged with color; the roller is then run over the stencil.—C. F. Herbert, Chicago, Ill.

### Concrete Piles without Forms

Although concrete piling is no novelty, a method of using bored holes as forms for foundation piles for a summer cottage may be of value in many instances. To secure solid footings for the sills in the case in question, an 8-in. post-hole auger was used, and the holes were bored about 5 ft. deep and 6 ft. apart. Sill levels were established and the holes filled with the concrete mixture to the ground level. Short sleeves or forms of 8-in. stovepipe were then forced into the soft concrete in each hole until the tops were on the established sill level. These extension-sleeve forms were then filled with concrete, with suitable anchor bolts imbedded in it.—T. W. Ingersoll, Buffalo, Minnesota.

### Geared Offset Screwdriver

A screwdriver, for use where the space above the screw head does not permit the application of the usual straight-handle type, is made, as shown in the drawing, from a speedometer joint, in which two bevel gears rotate shafts held at an angle to each other. There are usually two such joints on each speedometer, at the points where the flexible shaft is connected. The joint is modified by riveting a screwdriver blade to one end and fitting a handle to the second shaft, as indicated. In use, the casing about the gears forms a convenient hold for the palm of the left hand, while the right hand is used to turn the handle.




### Ammonia for Cooling Hot Bearings

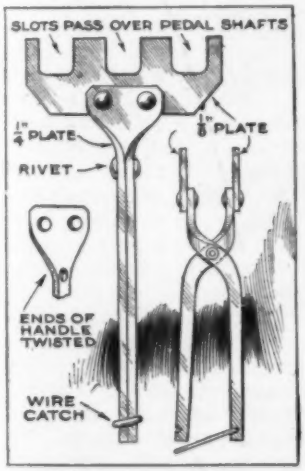
When a 100-hp. motor, running at 1,800 r.p.m. and driving a blower used to furnish the induced draft to a battery of six boilers, developed a hot bearing on the pulley side, it created a problem that was satisfactorily solved by cooling the overheated bearing with chemically pure ammonia.

The heating was caused by excessive

tightness of the belt, but although the tension was decreased immediately this was noticed, the bearing failed to cool, and as it was impossible to shut down the motor until the bearing cooled off, and flooding the bearing with oil produced no result, the ammonia treatment was used as a last resort. A small amount of chemically pure liquid ammonia was mixed into an emulsion with the oil, and the mixture was carefully and slowly fed into the bearing drop by drop; it sputtered at first, but after about 15 minutes' steady application, the bearing had cooled nearly to normal. The oil was then changed, and no further trouble was experienced. If the liquid ammonia is not chemically pure and nearly free from water, the water in the mixture will decrease the lubricating property of the oil sufficiently to render it useless for high-speed bearings. This system of cooling bearings by utilizing the rapid-evaporating qualities of ammonia has since been used many times with perfect success.—C. E. Diehl, Mammoth, Utah.

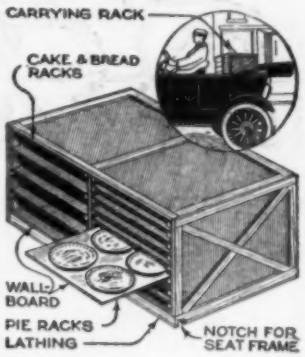
### Tool Clamps Auto-Transmission Springs

When replacing the cover of the light-automobile planetary transmission after repairs have been made, much difficulty is experienced in compressing the springs enough to get them between the ears of the transmission bands. The tool shown in the drawing is specially adapted for this purpose; it will compress the springs and hold them so that they can be inserted easily. The tool consists of a simple pair of tongs or pliers provided, on each jaw, with a slotted plate that fits over the springs. A link or catch in one of the handles slips over the opposite handle and retains the adjustment. The use of such a tool will immediately reduce the time of placing the transmission cover, especially when new lining has been placed on the brake bands.



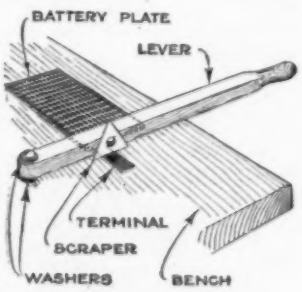

### Rack Makes Delivery Car of Touring Car

A baker made use of his passenger car to deliver the products of his shop to customers, by adding a rack that fitted neatly and securely into the back-seat frame after the cushion had been removed. A light but substantial wooden frame was made, covered with wallboard, and a notch cut in the underside of the frame bottom, to fit over the edge of the frame that retains the cushion. The whole rack was suitably reinforced with lattice strips, and shelves were made from wallboard, sliding on light strips. A central partition divides the rack into two compartments. This arrangement is easily removed from the passenger car and saves its user the cost of a commercial truck. The original rack has eight shelves with a capacity of 64 pies, but the shelving can be adjusted as desired.—O. H. Hampsch, Nashville, Tenn.



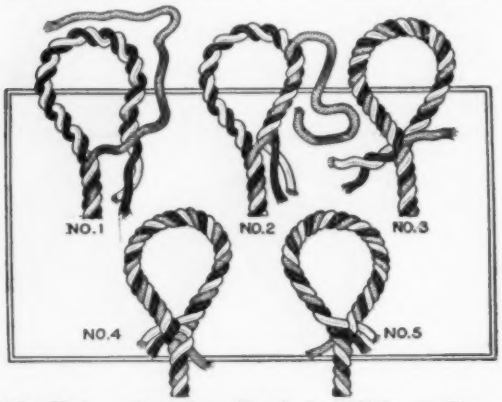

### Scraping Battery Terminals

Scraping the scale from the terminals of storage-battery plates is a tedious and time-consuming job, requiring a strong arm for continued work when done in the ordinary manner. By making and using a scraper of the type shown, in which the blade from an ordinary hand scraper is attached to a lever, the obstinate scale, on the positive plate in particular, can be removed with but a single operation for each surface, and the leverage makes greater speed possible. The lever is permanently attached to the bench top and has just enough vertical play to permit the insertion of the plate terminal underneath the scraper blade.—H. Sibley, Pasadena, Calif.



### A Superior Eye-Splice

Unless the workmanship has been very good, an eye-splice of the ordinary kind will become loosened, and eventually pull

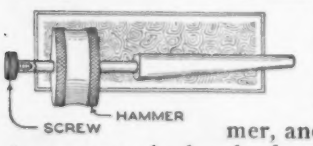



The Various Operations Required to Make an Eye-Splice Superior to the Usual One: The Steps Require but Little More Time than the Old Way

out when the rope is subjected to intermittent but excessive strain. In order to prevent this, the splice, shown in the drawing in the successive operations of making it, has been devised, and as can be readily seen, the rope must break before the splice will pull out. The splice is built on the principle of the one-strand grommet. A bight is made in the rope, one strand is unlaid, and then relaid around the eye in reverse order. The three ends are then worked under and over after the usual manner of making a short splice, or finishing an eye-splice. The work can be done in very little more time than is usually required for the other type, while the strength is greatly increased.—G. Dallas Hanna, San Francisco, Calif.

### A Handy Drill-Press Drift

A handy drift for knocking out sockets or taper-shank tools, made as shown in the drawing, does away with the necessity of using a hammer, and leaves one of the operator's hands free to catch the socket or tool as it is released.



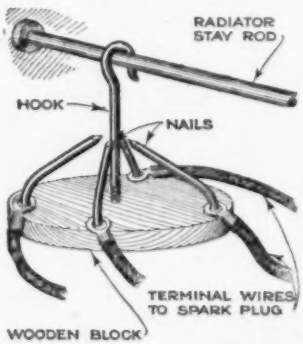

Made of ¼-in. flat stock, it is turned down at one end to form a guide for the sliding weight which takes the place of the usual hammer; the screw in the end prevents the hammer from sliding off. The side of the hammer is made concave to provide a better grip for the fingers. The drift is used in the same manner as ordinary ones, the blow of the hammer against the end of the tapered drift releasing the socket or tool.

### Tractor Started with Carbide

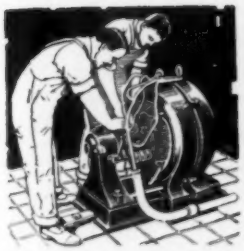
For starting my tractor in cold weather, I have a small tin can with a few 3/16-in. holes punched in it. A handful of waste is dipped in water and the surplus squeezed out. Four or five pieces of calcium carbide, the size of a pea, are placed in the middle of the wad, which is placed in the can. The can is shoved into the intake, and the flywheel turned over until the engine fires, which is usually on the first or second turn. As soon as the engine is operating properly, the acetylene-generating can is removed and placed in the toolbox.—Russell Adams, Seward, Oklahoma.

### Tester for Auto Ignition

An efficient tester for the ignition circuit of an automobile can be made from a circular block of wood, a screwhook, and some nails, as shown in the drawing. The nails are driven through the wooden disk, around the edge, and are bent over so that the points are at the proper distance from the central screwhook, by which the tester is suspended from the radiator stay rod. The spark-plug terminal wires are slipped over the nails and the motor turned over. Perfect sparking at the tester indicates that the ignition units are operating up to the spark plugs. For six and eight-cylinder engines a larger number of nails will be required, as one is needed for each spark-plug wire.




¶ In some drafting rooms the practice is followed of making long dashes for invisible lines, not only because they require less time, but also to preclude the possibility of a short dash near a dimension being mistaken for the figure 1, and read as part of the dimension.



# TESTING MOTORS, GENERATORS, and TRANSFORMERS

*By KENNETH C. COGGESHALL*

**Part I—Motors**

TESTS on motors, generators, and transformers are usually made to ascertain if the apparatus can carry additional load without injury; to make certain that the rating guarantees have been fulfilled; to see if the temperature rise is within safe limits; to determine the efficiency of the apparatus under varying loads, or to find the most economical conditions of operation.

It is often necessary to find the resistance of the windings, and this is done by connecting a voltmeter and ammeter in the circuit, as shown in Fig. 1, using a direct-current supply. The basis of this method, known as the fall-of-potential method, is Ohm's law, which states that the resistance of any circuit, in ohms, is equal to the electromotive force, in volts, divided by the current strength in amperes. Expressed as a formula, this is:

$$R = \frac{E}{I},$$

where R is the resistance in ohms, E the voltage, and I the current strength in amperes. The values of E and I are read from the meters simultaneously. It should be understood that the resistance of a winding increases with a rise in temperature, consequently, for purposes of comparison, it is best to note and record the temperature of the winding when the test is made.

The power input to a direct-current motor is measured as shown in Fig. 2, the connections being very similar to those of Fig. 1. While the motor is running under various loads, several readings of the ammeter and voltmeter are recorded, and the average value of E and I obtained. The product of the average values of E and I is expressed in watts, and represents the power input to the motor. The formula is:

$$P = E \times I,$$

where P represents the power, expressed in watts; E and I are, of course, the voltage and current strength as in measuring resistance. If the power is to be expressed in horsepower units, the product of E and I is divided by 746, as 746 watts are equivalent to one horsepower (Hp.); the formula then becomes:

$$\text{Hp.} = \frac{E \times I}{746}.$$

By comparing the ammeter reading with the full-load current value, as shown on the motor nameplate, a fair estimate of the load on the motor may be made, where no more accurate method of determining the load is available.

The efficiency of a machine is the ratio of the output to the input, or the power given out divided by the power supplied. Motor efficiency may be determined either by the measurement of its losses, or by actually measuring the output by mechanical or other means. The mechanical method, while not so accurate, is the simpler, and is the only one that will be described here. As shown in Fig. 3, a Prony brake is used to measure the horsepower produced. This consists of a pair of brake blocks, clamped on the pulley of the motor; a long lever fastened to one of the blocks, and a spring balance. If L represents the distance, in feet, from the center of the pulley to the center of the spring balance; W the pull or weight shown on the scale, and N the number of revolutions per minute of the motor, then

$$\text{Hp.} = \frac{2 \times 3.142 \times L \times N \times W}{33{,}000};$$

by making the length L equal to 5 ft. 3 in., the formula may be simplified to

$$\text{Hp.} = \frac{N \times W}{1{,}000};$$

that is, simply multiply the number of revolutions per minute by the weight shown on the scale, and divide by 1,000. If this result is multiplied by 746, the number of watts delivered is obtained, and if this figure is divided by the input, as calculated from the meter readings, the efficiency of the motor is obtained. The formula is:

$$\text{Efficiency} = \frac{746 \times \left(\frac{N \times W}{1{,}000}\right)}{E \times I},$$

Another formula,

$$\text{Efficiency} = \frac{8.52 \times L \times N \times W}{E \times I},$$

may be used; in this formula, N is the

number of revolutions per *second*. The result of either of these formulas, multiplied by 100, will give the percentage of efficiency.

It is often desirable to know at what load a motor operates most efficiently; some motors, for example, show their peak efficiency at a slight overload, others, again, at slightly under full load. To test, take readings at various loads, up to 50-per-cent overload, as compared with the nameplate rating. Using these values, calculate the output for each reading, and for each output value compute the per cent efficiency. This information can then be put into graphical form, as shown in Fig. 4. The curve will show the point of highest efficiency, as that point will be the peak of the curve.

Tests on alternating-current machinery cannot be carried out in the same manner as on direct-current apparatus. Another instrument, the wattmeter, must be employed to measure the actual power input or output. This is necessary because the voltage and current alternate in value from positive to negative, completing each second as many cycles as the frequency of the generator; the current strength also either leads the voltage or lags behind it, usually the latter, therefore the product of the volts and amperes is not the actual, but only the apparent power. The true or actual power is shown by the wattmeter, which is designed to compensate for what is known as the power factor.

The apparent power, in watts, is indicated by the formula:

$$P = E \times I,$$

but the actual power is

$$P = E \times I \times Pf.,$$

and the power factor (Pf.) is equal to the actual watts divided by the apparent watts, that is,

$$Pf. = \frac{\text{Actual watts}}{\text{Apparent watts}}.$$

The connections for testing a single-phase a.-c. motor are shown in Fig. 3. Taking the values of E, I, and P, where P is the wattmeter reading, then

$$Pf. = \frac{P}{E \times I}.$$

The kilowatt (Kw.) input is

$$Kw. = \frac{E \times I \times Pf.}{1{,}000} = \frac{P}{1{,}000}.$$

If a Prony-brake test is made, then

$$\text{Efficiency} = \frac{746 \times \left(\frac{N \times W}{1{,}000}\right)}{P},$$

that is, multiply the number of revolutions per minute by the weight, divide by 1,000, multiply by 746, and divide the last result by the wattmeter reading.

The formula

$$\text{Efficiency} = \frac{8.52 \times L \times N \times W}{P}$$

can also be used, N again being the number of revolutions per *second*.

To test a three-phase a.-c. motor, six instruments are necessary, as shown in Fig. 6, except where a switching system is provided, as in Fig. 7, when the tests may be made with but three instruments. The total input, in this case, is the sum of the wattmeter readings. If the load is very light, it is possible that one of the wattmeters will show a negative value. To obtain a reading, reverse the current leads. In this instance, the actual watts input is the reading of the positive wattmeter minus the reading of the one the connections of which were reversed.

It should be realized that the values found for each phase are not one third of the total, and that, considered individually, they mean nothing. In reality, the apparent power is equivalent to the product of E and I multiplied by the square root of 3, that is,

$$\text{Apparent power} = E \times 1 \times 1.73,$$

in which

$$E = \frac{E_1 + E_2}{2}, \text{ and } I = \frac{I_1 + I_2}{2}.$$

The total power is

$$P_1 + P_2;$$

and the power factor

$$Pf. = \frac{P_1 + P_2}{E \times I \times 1.73}.$$

In these formulas, it must be remembered that E and I are the average readings. $E_1$ is the reading of the upper voltmeter (Fig. 6); $E_2$, the reading of the lower one; and similarly for $I_1$, $I_2$, $P_1$, and $P_2$. The average values of E are obtained, as stated in the formula, by adding the readings of $E_1$ and $E_2$ and dividing by 2. The average values of I are obtained in the same way.

By using a Prony brake to determine the horsepower output, the efficiency at any load can be computed, and the data recorded graphically.

$$\text{Efficiency} = \frac{8.52 \times L \times N \times W}{P_1 + P_2},$$

N being the number of revolutions per *second*. If the full-load efficiency is known, the output in horsepower may be calculated thus:

$$Hp. = \frac{(P_1 + P_2) \times \text{Efficiency}}{746}.$$

In order that the operator may be able at any time to estimate quickly the output of the motor when the input is

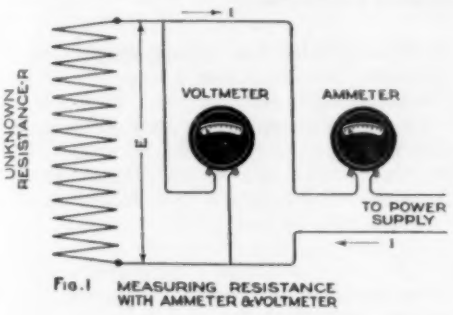



Fig. 1 MEASURING RESISTANCE WITH AMMETER & VOLTMETER

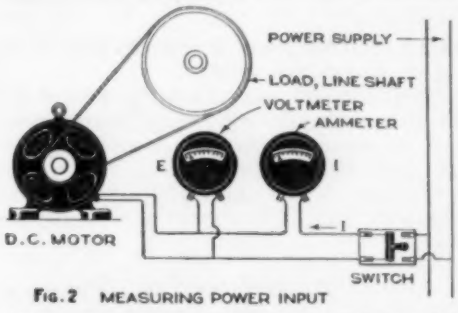
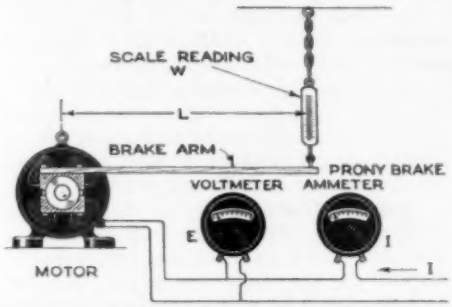



Fig. 2 MEASURING POWER INPUT




MEASURING MECHANICALLY POWER OUTPUT WHILE INPUT IS DETERMINED BY METER READINGS

Fig. 3

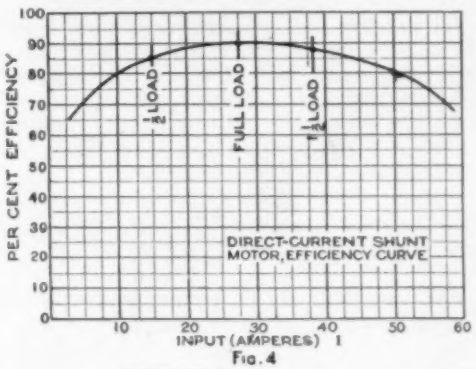
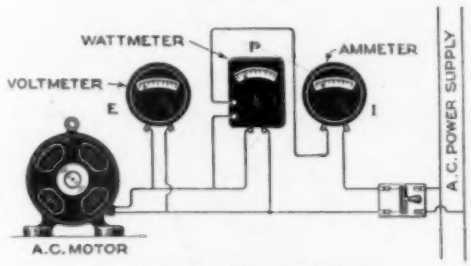
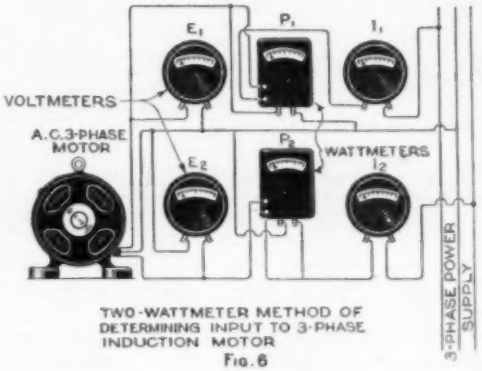



Fig. 4



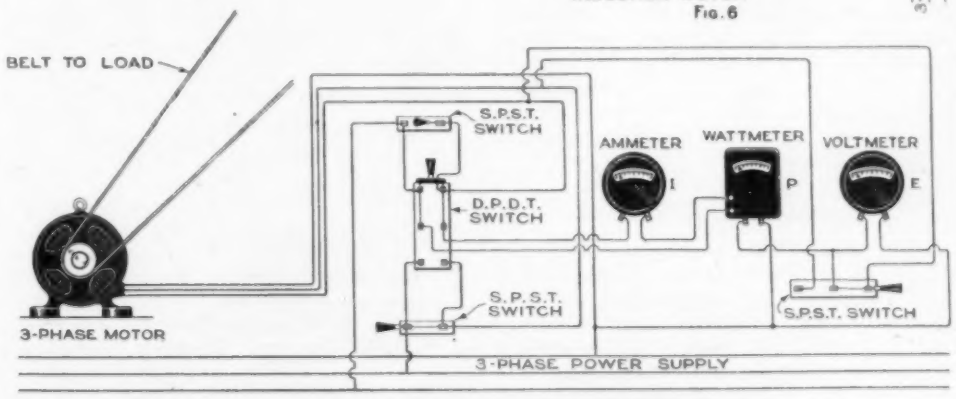

INSTRUMENT CONNECTIONS FOR TESTING SINGLE-PHASE A.C. MOTOR

Fig. 5




TWO-WATTMETER METHOD OF DETERMINING INPUT TO 3-PHASE INDUCTION MOTOR

Fig. 6




ONE-WATTMETER METHOD OF DETERMINING INPUT TO 3-PHASE INDUCTION MOTOR

Fig. 7

Fig. 1 Shows the Method of Measuring Resistance; Figs. 2 and 3, Connections for Power Tests on Direct-Current Motors, and Figs. 5 and 6, Connections for Testing Single and Three-Phase Alternating-Current Motors. Fig. 7 Shows How a Three-Phase Motor may be Tested with Only Three Instruments

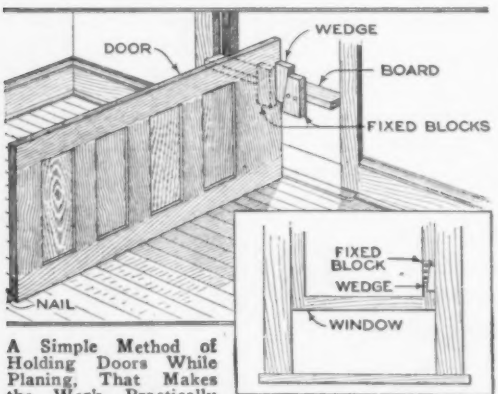
known, an efficiency curve, as shown in Fig. 4, should be plotted.

A very rough check of the power input can be made with only a voltmeter and ammeter connected in one phase. Compare the readings with the nameplate data. If the voltmeter reading is as specified, then the ammeter reading, as compared with the nameplate value, will indicate whether the motor is over or underloaded.

In calculating either input or output, the values of E, I, P, L, N, and W must be read as nearly simultaneously as possible, dividing the work between several persons if necessary.

### Wedge Holds Door for Planing

Carpenters, when planing doors, hold their work in a vertical position by inserting the end in a notched board horizontally between the door jambs. However, the work is not held rigidly, and it must be supported by the workman. A much more effective method makes use of tapered blocks affixed to the edge of the board, then, by inserting a wedge and tacking the door down to the floor at the opposite end, the work is practically immovable. Windows that overbalance their sash weights to such an extent that they cannot be kept up, can be wedged into position in much the same manner, as shown in the lower illustration.—Wm. E. King, Monessen, Pa.



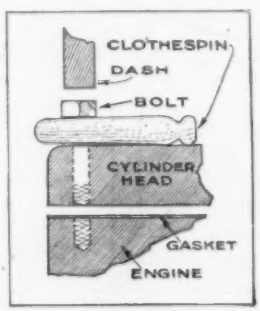

**A Simple Method of Holding Doors While Planing, That Makes the Work Practically Immovable. The Smaller Drawing Shows How Heavy Windows can be Held in Any Position by Wedges**

### Protecting Sprinkler Heads

To be sure that an automatic-sprinkler system is in good order the sprinkler heads should be carefully watched. Sprinkler heads having four different melting points are made; the lowest is 160° and the highest 360°. The latter are used in boiler rooms, drying rooms, and other places where there is a high temperature at all times. Extreme care should be used in replacing the sprinklers, so that only those of the proper melting point are used. To get the greatest protection from the system, however, the heads should have the lowest melting point that can be safely used. Where chemical fumes or moisture come into contact with and corrode the heads, the protection is decreased, because the thin skin of oxide on the surface increases the temperature required to melt the fusible metal. This trouble can be overcome by covering the heads with a waxlike substance that melts at a temperature somewhat lower than that required to melt the head. In a case where the likelihood of corrosion is great the heads should be changed frequently. Under some conditions, as in woodworking shops, paper mills, and the like, the heads become coated with flying particles of sawdust or paper pulp, which hardens and thus reduces their effectiveness. Paint or calcimine, that is accidentally smeared over the heads when painting, also lowers their efficiency. When painting or calcimining, the sprinkler heads should be protected by tying small paper bags over them, removing the bags when the work is finished.

### Clothespins Aid in Replacing Auto Cylinder Head

The last two bolts on the light-automobile cylinder head, are located directly underneath the dash, and must be in place while the head is inserted on the engine block. To push the head into place with these bolts protruding results in the gasket being bent or torn. The usual practice is to have a helper who holds the bolts while the cylinder head is being put on or taken off. A simple solution to this problem consists in the application of two clothespins, one underneath the head of each bolt, as shown in the drawing.

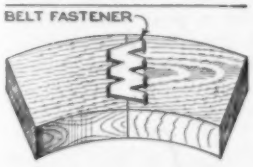


### Sharpening Tools with Mill File

That a fine flat mill file may be used for sharpening and dressing tools is a fact that many mechanics have overlooked completely. Possibly it is not generally realized that the edges of scissors, tinsnips, screwdrivers, and numerous other tools, are softer than the file and can be dressed down to a sharp cutting edge. It is advisable to keep an old file with a broad surface for this purpose, and use it by clamping the tool to be sharpened in the vise. Occasionally a tool too hard to file will be met with, and for this reason the use of an old file is advised. In sharpening scissors, especially when used for cutting cloth, the file-sharpened edges are better than oilstoned ones. The file marks should run downward and inward on both cutting edges; the wire edge left by the file is removed by simply closing the scissors as in cutting.

### Emergency Pinch Dogs

We had occasion to use a large number of small pinch dogs on a pattern job, and after we had used all we could find, we still needed several dozen more, and the shop boy came to the rescue with a box of belt fasteners. These were cut up so as to leave about three points on each side, and we discovered that the makeshift article was better than the regular manufactured pinch dog, as it not only drew the pattern segments together but prevented any lateral movement. Furthermore, any length suitable is easily made, they are cheap, and will not break at the corners like the factory-made article.—C. M. Graham, Waterloo, Ia.



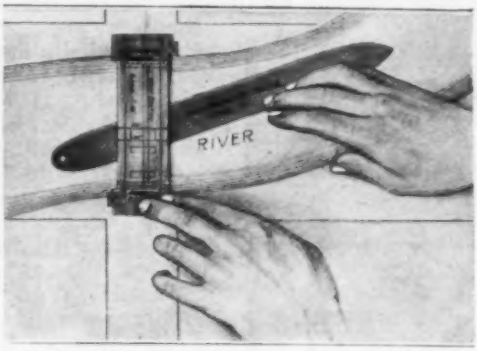

### Insuring the Sweeping of Corners

One concern, which found that the janitors, when sweeping, consistently slighted the corners, has now painted all the corners in the factory white. The paint extends about a foot up the walls, and an arc of about 1-ft. radius is painted on the floor.

Where corners are dark, this brightens them up, and dirt is easily seen. The corners are not slighted now.—A. MacCullough, Chicago, Ill.

### Bridge Models Show Problems Clearly

A little time spent in the drafting room in the making of models similar to those illustrated will save a great deal of useless argument in consultation with engineers, business men, and commissions in large cities. It will be immediately apparent to even those most unfamiliar with the problems involved, just what size boat can pass up the river and through the proposed bridge. The outline model of the bridge is adjustable so that the distance between the abutments can be increased or shortened. It is only necessary to place the models, which are cut from ordinary Manila drawing paper, on a map of the proper scale to make the situation self-explanatory.

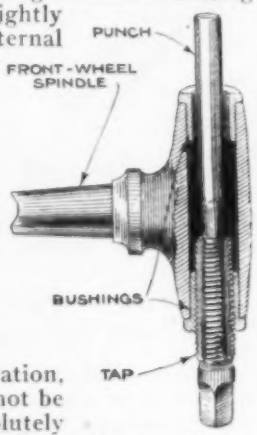



**Paper Model for Showing the Relation of a Proposed Bridge to the Shipping That Must Pass Through, Makes It Possible to Present the Situation Clearly to Those Unfamiliar with the Problems Involved**

### Bushings Removed with a Tap

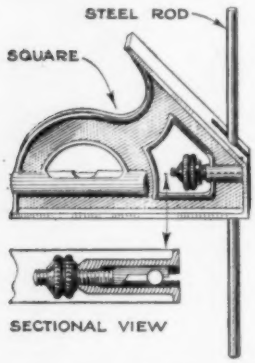
A simple and convenient method of removing a small bushing consists in cutting into it with a tap slightly larger than the internal diameter of the bushing. With the tap in place, a punch or drift is used to drive the bushing out from the opposite side, in cases where this is possible.

Old taps are useful for this purpose and, as the tap is likely to be injured in the operation, a good tap should not be used unless absolutely necessary, and then only with great care. Coarse-threaded taps are better than finer ones for this purpose.



### Useful Attachment for Square

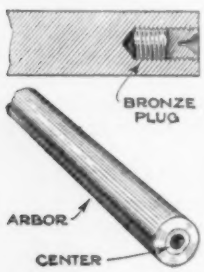
By fitting up his combination square as shown in the drawing, so that a cold-rolled steel rod can be inserted and tightened in position instead of the usual straightedge blade, a pattern-maker doubles the usefulness of this indispensable tool. A hole that will make a sliding fit for the rod is drilled through the head, as shown in the detail, and a semicircular groove is filed in the clamping bolt, just back of the jaw, to allow the rod to pass through it.




This arrangement enables the tool to be used as a depth gauge in small holes or slots where the rule will not enter; by inserting a small steel point near one end of the rod, a good marking gauge is formed.

### Improved Centers for Arbors

An improvement on lathe and milling-machine arbors, that overcomes the all too familiar burring of the centers, has been used by the owner of a general machine shop with satisfactory results. The idea is simplicity itself, and consists in boring out the working end of the arbor to a depth of about 1 in. with a 5/16-in. drill; this hole is tapped to accommodate a 3/8-in. threaded bronze plug. The plug is screwed in flush and centered in the usual way. The bronze center produces a bearing that is tough, yet not hard enough to burr the lathe centers.—John M. Pipp, Muncie, Ind.

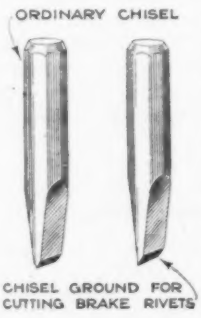



### Umbrella Ribs for Welding Rods

I have been using the ribs from old umbrellas in place of welding rods for such work as lengthening twist drills, augers, and for sheet-metal work, with perfectly satisfactory results. On account of the thinness of the ribs a smaller flame is required to melt them, and no hard spots are apparent in the weld when machining or filing. When the neutral flame strikes the rib, numerous sparks will appear which may cause the operator to believe his torch is not adjusted properly, or that the steel is burning. This is merely the action of the oxygen on the rust and enamel on the rib, and does not interfere with the free flow of metal into the weld.—Fred Brand, Middletown, N. Y.

### Cutting Brake-Band Rivets

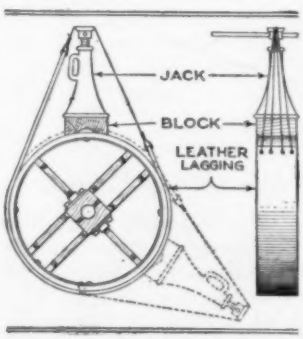
To cut off the old rivets cleanly, when relining brake, clutch, or transmission bands of an automobile, without bending them over, the cold chisel used should have a specially ground edge.




The ordinary cold chisel is beveled on both sides, but, to get the most satisfactory results with the type of rivets generally used for the purpose mentioned, the chisel should be ground with a bevel on but one side and used with the flat side against the band.—J. H. Rouse, San Francisco, California.

### Stretching Leather Lagging on Pulleys

When it is desired to stretch a piece of leather over the face of a pulley to increase its diameter, or to reduce slip, and to rivet it in place, the mechanic finds that he does not possess enough hands and fingers to manipulate the lever that is commonly used, and to insert and head over the rivets while the leather is taut.

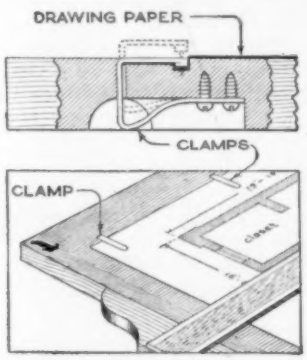



The drawing shows how an ordinary screw-jack is used by one old-time mechanic to draw the leather lagging up tight, and hold it thus while the rivets are inserted and headed. Holes are punched through the end of the leather, which should be

about 3 in. longer than necessary to reach around the pulley. The ends of the belt are connected by a number of strong wires, twisted together into a single strand and placed over the head of the jack. With a V-block underneath the jack, the screw is turned until the leather, which has been previously soaked in warm water for about 10 minutes, is sufficiently stretched. Rivets are placed in holes drilled through the leather and pulley, except in two near the rim of the pulley on the side opposite the jack. The jack is loosened, the wire removed from one end and this end cut off squarely. The jack is then reset in the position indicated by the dotted lines, the free end of the wire being inserted into the holes in which no rivets were inserted. The leather is again stretched and the rest of the rivets inserted. The jack is then removed, the ends of the lagging scarfed off, and the final rivets inserted where the wires were attached. When the leather becomes dry, as nearly a perfect fit as it is possible to obtain will be the result.—Geo. G. McVicker, North Bend, Neb.

### Clamp for Drawing Board

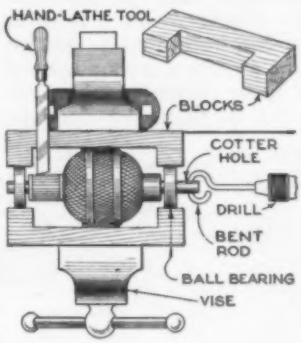
The clamp shown in the drawing eliminates the need of thumbtacks to hold standard-size drawings to the board, and it will not spoil the board for use in making larger drawings, as the clamp is let in flush with the surfaces of the board. Only two clamps are used, and they are located at the top of the board in such a position that they will accommodate the majority of the drawings. The clamps are made from spring wire and fit into mortises of the proper size, cut in the surface of the board. A recess is made for the fingers on the underside of the board, so that the springs can easily be pressed upward.—Geo. Simonson, Cambridge, Mass.




¶The boiler should be set 30 to 42 in. above the fire grate to give room for air and gases to mix.

### Truing Small Commutators in a Vise

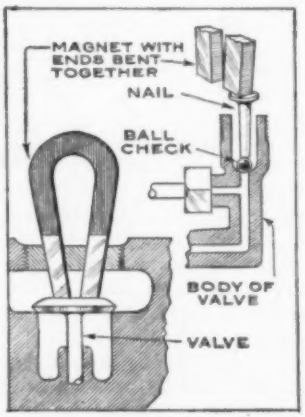
In truing up the commutator of a small motor generator, such as found in automobile electric systems, when no lathe is available, the vise set-up illustrated can be used. Two wooden blocks, relieved at their centers to clear the winding, are clamped in the vise, the armature being held by its ball bearings, so that it can rotate freely.




At one end of the shaft is a hole for a cotter or taper pin, and this is connected to a drill chuck in the manner shown. Then, while the work is being rotated, a hand lathe tool is brought to bear against the copper and the proper amount of metal removed. Sandpaper is used to smooth the turned work and give a polished finish.

### Removing Ball from Check Valve

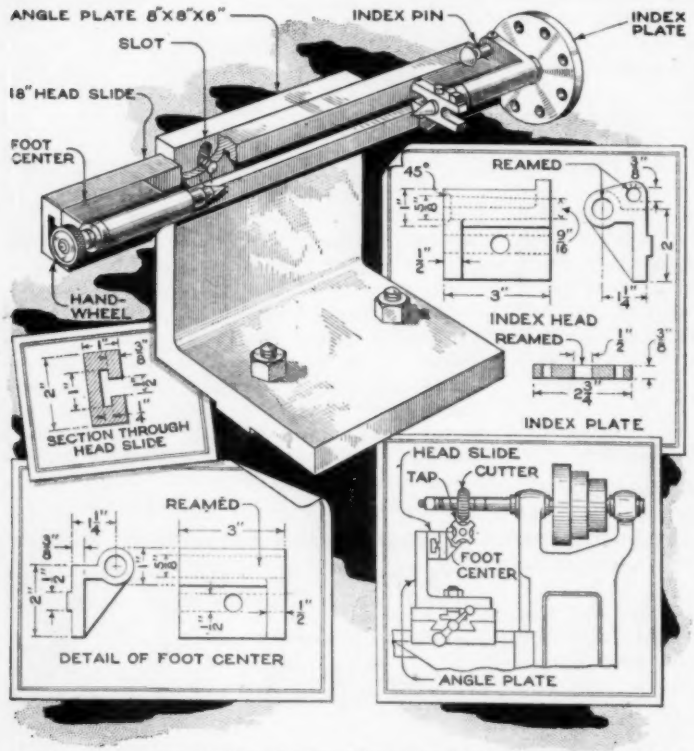
An ordinary horseshoe magnet, kept around the automobile repair shop, will make it possible to remove easily the balls from oil check valves, inaccessible valves, and other parts that it is difficult to get a grip upon with fingers or tools. A magnet from an old magneto, with its ends bent close together, but not in contact with each other, can be found around almost any shop and will give excellent results. In removing the check-valve ball, a nail or similar short piece is inserted into the valve, and nail and ball drawn out together. Brass parts are unaffected by magnetism and therefore cannot be removed in this manner.



# A Tap and Reamer-Milling Fixture

By J. V. ROMIG

INEXPENSIVE, yet a useful and time-saving addition to the shop equipment, the tap and reamer-milling fixture described in this article fully justifies the slight cost of its construction. With it, taps and reamers can be milled as quickly and as accurately as when using a large and bulky index head. Furthermore, this fixture permits the work to be done on a small miller, thereby saving the larger miller and its index head for larger and possibly more important jobs. Being self-contained in a single unit, much time is saved on the set-up of each job, as the fixture only requires to be clamped to the milling-machine table with two bolts.




A Tap and Reamer-Milling Fixture That Has Its Index Head Self-Contained: It Accommodates Itself to Tapered Work, and can be Mounted on Small High-Speed Millers

The base of the fixture is an angle plate, machined square on its bottom and inside faces and having a tongue on the bottom machined to fit the table slots; to this the head slide is bolted with two capscrews. The capscrew on the index-center end is a turning fit in a hole drilled in the angle plate, while the other, at the foot-center end, slides in a curved slot, so that the slide can be tilted to take care of taper work. The head slide is machined from cast iron to the form and dimensions shown; it is machined all over and the T-slot is cut throughout its length.

The index head and foot center are cast in soft gray iron from simple patterns, and machined to the dimensions given. The index-head spindle is taper-turned, and should be a snug fit in its bearing. It has a center turned on its front end and is also threaded for the index plate.

The index plates, of which there should be several, say, one of 16 holes and another of 18 holes, give nearly all the spacings needed in the fluting of taps or reamers. The indexing is done by pulling the pin out, rotating the plate by hand, and then inserting the pin to hold the head in position. The foot-center head slides along the front face of the head slide, and can be clamped in any position to suit the length of the work held between the centers. The foot-center spindle should be of hardened tool steel and be fitted with a screw and hand-wheel for advancing the center into the work, as in a lathe tailstock.

By using a fixture of this type, more speed can be made on small work, as it allows the work to be done on a high-speed machine of small size.

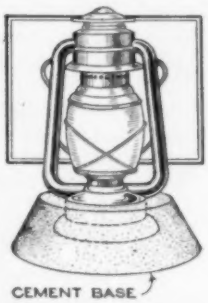
## Lock and Chain Prevent Accidents

Deaths and accidents are often the direct result of a machine being set in motion by some one who does not know that there is a man working on it. Practically all such accidents can be prevented by providing the men who do work of this kind with a piece of chain and a padlock, and making the use of them compulsory, to lock the starting lever, switch, or whatever it is that makes the machine operative. In the same way, whenever it is necessary for a man to enter a boiler, gasometer, or similar ves-

sel, he should lock all inlet-control valves, and take the key along with him to prevent the steam or gas from being turned on. Sprinkler-system valves, and other valves that are connected to the fire-protection system, which should be kept open, can also be kept from being closed by the application of a lock and chain.

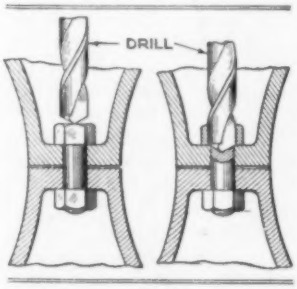
### Cement Bases for Lanterns

Lanterns that are used by contractors and municipalities to warn traffic against obstructions or dangers in the roadway are easily upset and extinguished by the wind, when set on the ground. If suspended from a barricade or stake there is frequently considerable swaying that may dislodge the lantern and extinguish the light. However, by molding a cement base around the oil reservoir of the lantern it can be set on the ground with every assurance that it will not be blown over or accidentally upset.



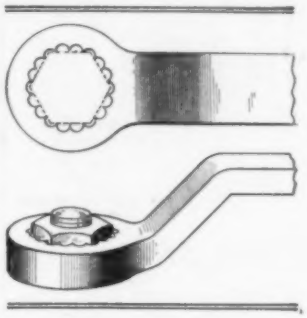

### Removing "Frozen" Bolts

Owing to rust, or the end of the bolt being riveted over the nut, bolts in the chassis of automobiles frequently resist all efforts to start them with wrenches, and sometimes they are so located as to prevent the use of a chisel or drift on the nut. A simple method for removing such bolts is to drill through the bolt head down into the body of the bolt. Make a punch mark in the center of the head, and using a drill slightly larger than the diameter of the bolt body, drill as shown: if an air or electric drill is used, the bolt will be out in a comparatively short time. In any case the drilling method is better than cutting the head off the bolt, as there is no possibility of a flying bolt head striking and injuring anyone, breaking a window, or doing any other damage.




### Wrench for Cylinder-Base Nuts

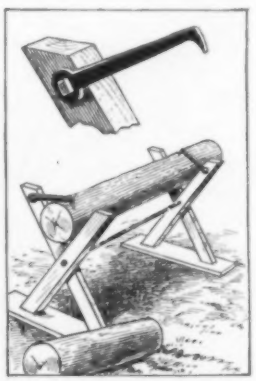
Cylinder-base nuts are, in many cases, so located that they can only be turned with a chisel. The reason for this is simple; the corners of the hexagon nut being 60° apart, the nut requires to be turned 60° before the wrench can be replaced on it and the turning movement continued; on the other hand, conditions usually permit turning the wrench no more than 30°, obviously making it impossible for the common wrench to resume its hold on the nut.



The drawing illustrates the construction of a simple wrench that will grip the hexagon heads of capscrews or nuts in any position so that the wrench can turn the nut as far as possible. A circle of holes is drilled in the wrench, as indicated, and the center piece knocked out; with this arrangement, no matter in what way the wrench is applied, the corners of the nut or bolt head will fit into some of the holes in the manner shown. The wrench head should, of course, be case-hardened.—C. Nye, New York, N. Y.

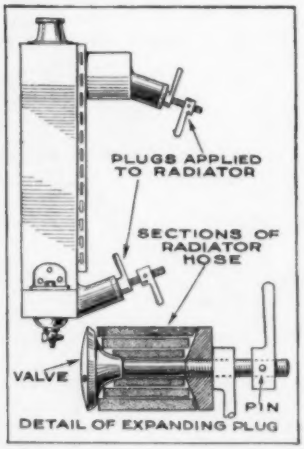
### Dogs Aid in Sawing Wood

Two simple grippers, or dogs, fastened to opposite sides of a sawbuck, as shown in the drawing, will greatly facilitate the work of sawing wood into stove lengths, by holding it so that it cannot move as it is being sawed. The dogs are made of iron and bolted to the buck in the manner shown. In use, the sharp points are pressed into the wood, relieving the sawyer of all the effort that is generally required to keep the wood from turning a little with each stroke of the saw.—P. T. Williams, Hairoa, N. Z.



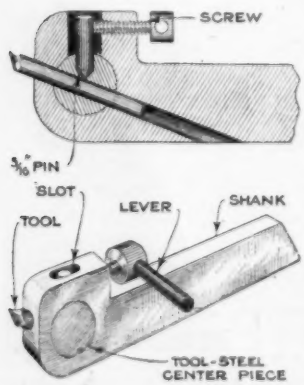
### Plugs for Radiator Testing

Old automobile valves are utilized for the essential parts of the automobile-radiator testing plugs shown in the drawing. The end of the stem is threaded and two threaded handles and a conical washer are provided. In assembling the plugs, a number of sections of heavy rubber tubing of different diameters are slipped over the valve stem, the conical washer applied, and then the two handles, one of which is pinned rigidly to the valve stem, as shown. In use, the plugs are inserted into the openings of the radiator headers and the handle screwed down; this forces the sections of rubber tubing against the valve head and conical washer, causing the rubber to expand and completely fill the opening, so that the radiator can be tested for leaks.




### A Novel Toolholder

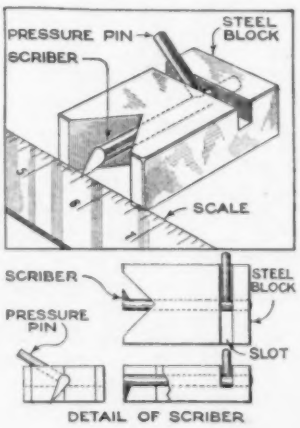
The toolholder shown will be found handy when used on work that requires a frequent changing of tools, as it is self-contained, requires no separate wrench to operate it, and is very quick in action. Very little pressure is required to secure or release the tool, as the holder is built to secure extra leverage.




The body of the holder has a 1-in. hole reamed through it at right angles to the shank, and a 5/16-in. slot is cut in the top. A short piece of drill rod is driven tightly into a disk of 1-in. tool steel, which is made a snug fit in the reamed hole. The holder is drilled and tapped for a tightening screw, the head of which is drilled for a 3-in. length of drill rod that serves as a lever. When the piece has been thus assembled, a hole is drilled, at the proper angle, clear through the holder and the tool-steel disk or centerpiece. This hole is afterward broached square to take the tool bit. While the broaching is being done, a piece of packing is placed in the slot, and the screw is tightened on this to hold the centerpiece firm. The lever in the tightening screw should be set in a vertical position when the tool is released, one-quarter turn tightening the tool and bringing the lever down to a horizontal position. It will be immediately apparent that the screw, bearing on the pin driver in the centerpiece, forces the latter around and binds the tool on the bottom of the square hole.

### Precision Scribing Tool

It is an exceedingly delicate operation to scribe a perfectly true line along the edge of a scale with an ordinary scriber or scratch-awl. Since the scriber is round and tapering to a point, and it is almost impossible to keep the hand in exactly the same position the whole time the line is being drawn, an uneven line usually results, which may cut through a fine center on one end of the work and probably be off at the other. If the line is not exactly true, other attempts will be necessary, and this will make other fine lines that will be confusing.




The tool shown in the drawing will draw a dead-straight line exactly between two points, providing, of course, that the scale is accurately placed on the points. The body is a steel block, ground on the base, with a V-cut in the front end. The piece is drilled from the back end clear through to the center of the "V," to take the bent scriber, which is made as shown. A slot, cut across the top of the block, enables a pin to be threaded into the

scriber in a position at right angles to the scriber point. When the piece is thus assembled, a light finishing cut, preferably on the grinder, is taken across the front of the block and end of the scriber, insuring that these will form a dead-flat face.

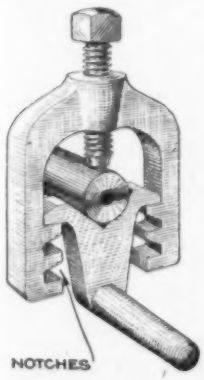
In use, the block is placed close against the edge of the scale, and, with one finger pressing on the pin, the block is drawn along the scale, scribing a light or heavy line according to the pressure exerted.

### Auxiliary Automobile Seat

The auxiliary automobile seat illustrated is designed for the use of a child, and is simply constructed of iron rod and a board of suitable size to form the seat. The iron rod is bent to form a hook that fits over the back of the car seat, and the board is attached to the lower ends. Arms for the seat are made from the same material and fastened to the underside of the seat, which can be upholstered as desired, or, by the exercise of a little more ingenuity, the back and arms may be formed of one length of rod. Completed, the seat is intended to elevate the young passenger so that he can see over the side of the car.—F. C. Davis, St. Joseph, Mo.

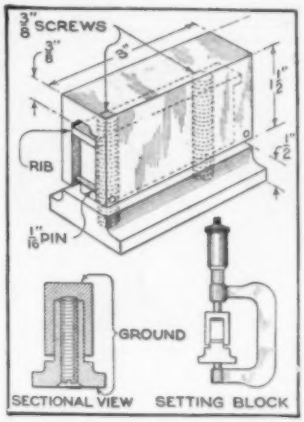
### An Adjustable Lathe Dog

The drawing shows a lathe dog that is capable of holding various sizes of work. Merely by releasing the regular binding screw at the top and dropping the lower portion of the dog a notch, larger work can be accommodated. The design is very simple, the parts easily made to suit individual requirements, and considerable time can be saved because a large variety of sizes is not necessary. This dog is driven from a faceplate in the usual manner, the tail being made to fit into the slot in the plate.




### Adjustable Parallel Blocks

A very handy and useful parallel block that will save much time, and facilitate setting of work, is made according to the form and dimensions given in the drawing. The vertical adjustment is made by two screws that support the upper member. Such blocks can be used individually, in pairs, or threes, as the job in hand may require, and, by using a micrometer as in the drawing, the blocks are easily set to the same height. The screws should be threaded with a fine S.A.E. thread, which will permit close adjustment. The base of the block is shaped, drilled, and tapped as shown, and notice should be taken of the retaining rib that keeps the two parts of the block from coming apart. The base is wide enough to furnish a good support, and it, as well as the top, is ground to a flat surface. The upper member slips over the tongue of the base and is countersunk for the points of the adjusting screws. A small pin through each end of the upper member catches against the rib and holds the top and base together.



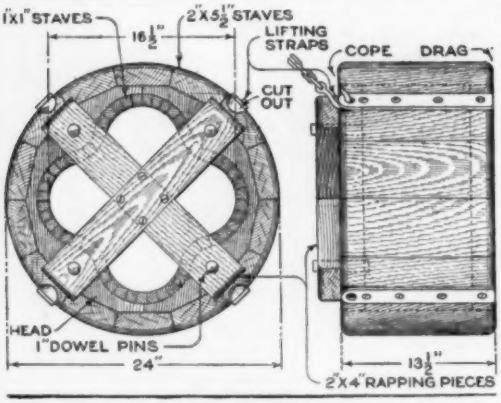

Blocks of different heights, each set overlapping the other in its limits of adjustability, should be made; one set with a 1-in. adjustment, starting with a height of 2 in. and opening out to 3 in., with the next size opening from 3 to 4 in., and so on.

### Gravel in Concrete Mixtures

Most bank-run gravels contain a great deal more sand than is desirable in a concrete mixture. Sometimes this sand is twice as great in quantity as would be best. If about 75 per cent of bank-run gravel were fine material, the proper proportion of cement would vary widely from that required in case only 30 per cent of the gravel were fine material. Only by separating the fine sand from the pebbles can definitely specified concrete mixtures be secured.

## Unusual Type of Pattern Construction

It is common practice among pattern-makers to build a cylindrical pattern in segmental courses, in which case it is of




**A Method of Building Cylindrical Patterns That Uses Staves Parallel to the Center of the Pattern Instead of Segmental Sections, Makes the Work of the Molder Easier and Prolongs the Life of the Pattern**

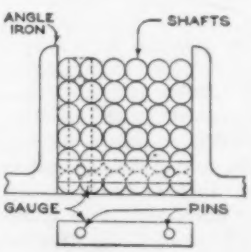
the utmost importance that the lumber is thoroughly dried and seasoned; that the segments are securely glued and fastened together, and that at least three coats of good varnish are applied to the surfaces of the finished work. If these things are not done carefully, the damp molding sand will loosen the glued joints, causing the segments to warp, twist, and contract or expand, so that the pattern will not be truly cylindrical. This expansion or contraction will cause pockets in the sides of the cylinder, in which one or more segments may overlap slightly. When this occurs, the molder has a troublesome job in extricating the pattern from the sand mold, and the sand that forms the face of the mold is, in many cases, "sheared" away when the pattern is lifted from the mold. A pattern in this condition receives rough treatment at the hands of the molder, as considerable rapping is required to loosen it enough to enable him to extract it from the mold.

The objections above outlined, and others that could also be cited, do not apply to cylindrical patterns of the type shown in the drawing; if they did, very few castings could be produced from it, as it has a rather weak cross section. The pattern is made stave-fashion, with the staves running parallel to the center instead of being built up in segments. The pattern consists of the heads and the outer and inner staves. Contrary to the usual practice of making the heads in a complete circle and building the staves around them, the heads are made in two pieces that are temporarily held together on a flat board. The body staves are next fitted and fastened to these half heads. The half pattern is now removed from the board, and reinforcing pieces are fastened inside the heads with an overlap at the joints, to which the opposite half of the pattern is fastened. The opposite half heads are put in place and fastened securely with glue and screws. The inside staves are fitted and fastened with glue and finishing nails, and finished with a round-bottom plane to the required shape and dimensions. This is done very simply, if the pattern is laid out and built up correctly. The pattern is now turned and finished in the lathe, sanded, and given three coats of good black varnish. The $\frac{3}{16}$ by $1\frac{1}{4}$-in. lifting straps are then fastened to the side of the pattern. The straps are made the same length as the pattern and do not project beyond it, and cup-shaped depressions are cut into the wood to permit the insertion of hooks into the holes in the straps.

A novel feature of this mold is the rapping piece, made from two pieces of 2 by 4-in. lumber, fastened at right angles to each other. This piece has a 1-in. dowel pin at each end which fits into holes in the cope head. Instead of the heavy iron bar that is usually driven into the pattern for rapping purposes, the rapping is done on the rapping piece, which is put on after the cope flask has been lifted, and removed after the rapping has been finished.—M. E. Duggan, Kenosha, Wis.

## Marking Off Centers on Shafts

When large numbers of short lengths of round stock require to be marked off at the ends, preparatory to center drilling, much time can be saved by the simple set-up shown in the drawing, together with a special marking-off gauge.



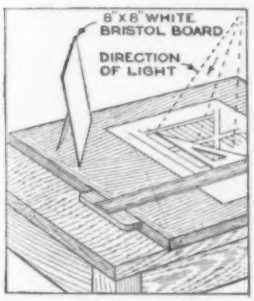

Arrange the shafts, after cutting to the proper length, in layers six wide and six deep, between two angle plates bolted down to a drill-press table, or other plane surface. The gauge can be made from any flat stock, but its width must be the exact diameter of the shafts. A pin is driven into each end

of the gauge, their diameter being such as to make them a snug fit into the spaces formed by the junction of four shafts. The distance apart of these pins is the same distance as the first and last spaces in the rows of stock.

When marking off, place the gauge in a horizontal position, with the pins in the spaces, as indicated in the drawing, and scribe a line along the shafts; this will give the center in one direction. After the lot has been scribed horizontally the gauge is placed in a vertical position and lines are scribed perpendicularly, the intersections of the horizontal and perpendicular lines being the centers of the shafts.

### Light Reflector for Drafting

Often the light on a drafting board is poor and the shadows of the triangle and T-square are dense enough to cause eye-strain in detecting the exactness of the lines to be drawn or traced. Under such conditions it is advisable to use a reflector of the type shown in the drawing. Nothing more than a square of white Bristol board is required, with a strip of the same material glued to the back to form an easel. By moving the reflector about so that the shadows are illuminated by the reflected light, the strain on the draftsman's eyes will be considerably lessened.—Truman R. Hart, Ashtabula, Ohio.

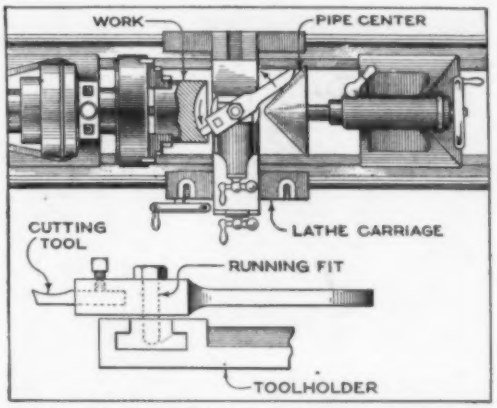



### Galvanizing Brass and Copper

Copper and brass may be coated with metallic zinc in the following manner: Place finely divided zinc in a nonmetallic vessel, and cover it with a concentrated solution of sal ammoniac. This is heated to the boiling point, and the copper or brass articles are introduced. A few minutes in the boiling bath will suffice to produce a firm and brilliant covering over the surface of the work. The zinc can be reduced to the requisite fineness by pouring the melted metal into an iron mortar and pounding it with an iron pestle until the solid mass has been granulated to the desired fineness.

### A Simple Radius Tool

The illustration shows a simple and almost automatic arrangement for cutting radii in a lathe. It only requires that the

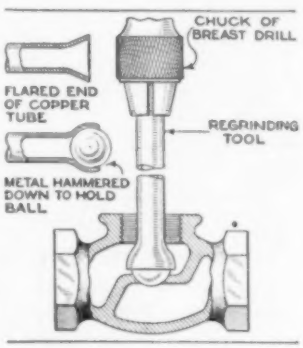



A Simple Radius-Cutting Tool That Is Almost Automatic in Its Operation: The Toolholder is Pivoted, and a Projecting Tail Bears against the Conical Center

tailstock center be fed forward. The tool bit is held in a holder that is pivoted at its center to the cross slide, in the manner shown. The projecting tail of the holder bears against the pipe center held in the tailstock. Consequently, as the conical center is fed forward, the tool is forced to travel in an arc.—Jos. F. Convery, Worcester, Mass.

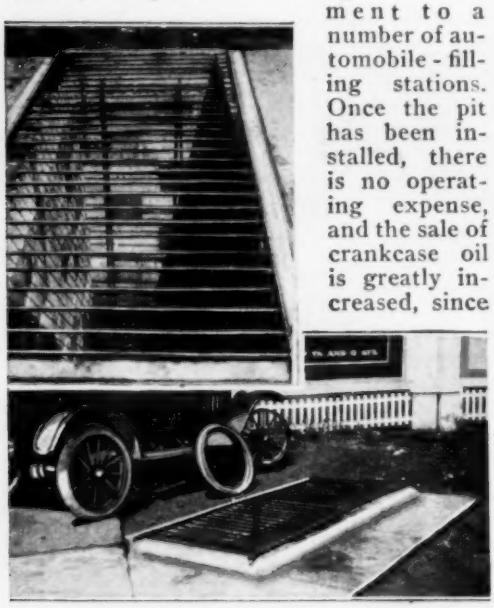
### Grinding Ball-Check Valve Seats

After a considerable period of use, ball-check valve seats will pit and rust, the valve will leak, and it will be found that the trouble cannot be entirely corrected by the insertion of a new ball into the worn seat. It is a simple matter to regrind such a check-valve seat by the method illustrated. The end of a piece of copper tubing is flared by driving it over one of the hardened steel or brass balls used. After the end is flared, it is hammered in to hold the ball securely. With this tool, held in the breast drill, and a small amount of valve-grinding compound, the seat of the valve may be quickly reground.



### Drain Pit for Filling Stations

A small pit used for draining crankcases, and placed convenient to the filling station, has proved to be a good investment to a number of automobile-filling stations. Once the pit has been installed, there is no operating expense, and the sale of crankcase oil is greatly increased, since



A Concrete Pit for Automobile-Service Stations Facilitates Drainage of Crankcase Oil. A Five-Inch Molded Rim Prevents Cars from Running over the Edge, and the Pit is Covered with an Iron Grating

the draining is not charged for. The stations can afford to do the work of draining the crankcases of their customers' cars free, since it results in the sale of several quarts of oil in each instance.

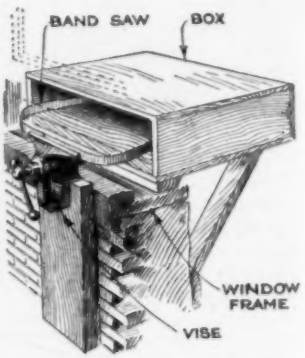
The pits are of concrete, made with a 5-in. molded rim, to prevent cars from running over the edge. An iron grating is always kept handy, and is put over the opening when the pit is not in use, to prevent accidents. By providing filtering facilities, the oil that is drained from the crankcases can be restored to salable condition, and can be sold for the lubrication of farm machinery and similar purposes.

### Preventing Loss of Tracings

The chief draftsman in a large shop uses a very effective method of keeping track of tracings taken from the file by draftsmen for reference, alteration, or other purposes. A draftsman taking any tracing is required to leave with the file clerk a receipt in the form of a card 2 in. wide and 3 in. high, which is then filed by number in a tray. When the tracing is returned, the file clerk destroys the card before filing the tracing. This much of the procedure is very common. The shop referred to had experienced a great deal of trouble because the draftsmen failed to return valuable tracings, and the receipt cards remained forgotten in the file. To prevent this, all the blank cards are now beveled off at the top; one month, cards are used beveled off toward the right side of the card, and the next month's supply of cards are beveled off toward the left. Toward the end of the month the file clerk goes through the card tray and takes out any cards which show by their bevel that they are remaining from the previous month. He then inquires of the writer of each of these receipts why he has not returned the tracing. If there is a good reason for keeping the tracing so long, the old receipt is destroyed, and a new one written on a card beveled to conform to those for the current month. In this way, the receipt file is brought up to date at the first of each month, and cases of "buried" and forgotten tracings are avoided.

### Window Box Aids in Filing Band Saws

In pattern shops and other places where band-saw blades are filed frequently, the arrangement shown will facilitate the work of setting and filing the teeth, and keep the saws from getting snarled up on the bench or floor so that there would be—as there generally is in such cases—danger of breakage. A wooden box is permanently fastened to the outside of a window frame, so that it will clear the sash and not interfere with its operation. The folded saw is inserted in the box, where it is kept coiled throughout the operation. In this manner the saw filer requires but a minimum of room for his work, and he can get his vise as close as possible to the source of light.



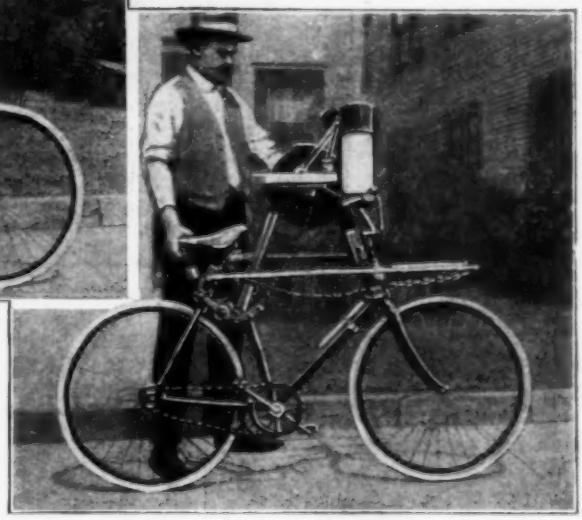

¶ In addition to the time-honored expedient of ruling lines for tables on the reverse side of a tracing, this side can be used for inking in temporary details. These can be removed later without affecting the main drawing.

Amateur Mechanics
Information as to where to obtain any specified materials or parts for making objects described in the following pages may be had, on request, from our Bureau of Information.—Editor.

# Bicycle Grinding Outfit with Many Original Features

By JOHN ANSON FORD

BY constructing a particularly ingenious grinding outfit, which is mounted on a bicycle, a westerner has emancipated himself from indoor shop work, and provided himself with a practical means of earning a livelihood in a congenial manner. The equipment is such as any person used to handling tools can make with little or no difficulty.



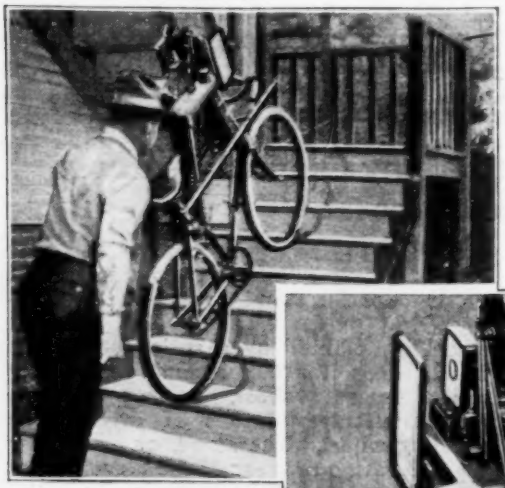
A Tool and Knife-Grinding Outfit Mounted on a Bicycle, the Rear Wheel of Which is Raised by Long Rods: The Upper Photograph Shows the Rods Extended; the Lower Picture Illustrates How the Rods Fold Out of the Way

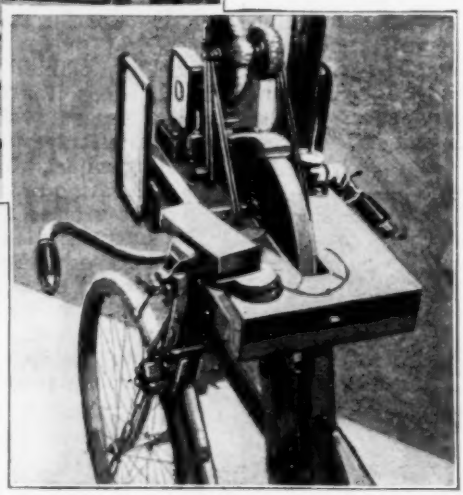
The equipment, as illustrated in the several photographs, is original with the builder, who worked up his own design. It consists of an oak frame that forms a table on which a fine-grained emery wheel, for knife and tool grinding, is mounted. The ordinary arbor of the grinding wheel was removed, and a bicycle hub substituted, to insure even, easy running. A small sprocket on the side of this hub carries a chain, which runs over another sprocket, also mounted on a bicycle hub; this is fitted with a friction wheel, which is brought into contact with the rear wheel, when the rear of the bicycle is raised from the ground on the special stand provided for making the outfit stable. The friction wheel is operated by a spring-held lever which holds it firmly against the rubber tire of the rear wheel, and so provides a very satisfactory means of driving the grinding wheel. The stand, or frame, for elevating the rear of the bicycle from the ground and supporting both the outfit and its operator, consists of two rods, about 5 ft. long, which are hinged to a block fastened just underneath the saddle; these are spread out, and their ends thrust into the ground, when the grinding outfit is to be used.

To each side of the machine two chains are fastened, one to the rear of the frame, at the hub, and the other at the upper end of the front fork. When the supporting rods have been put into position, the chains are stretched taut to the lower ends and fastened there by hooks, thus forming a rigid support.

The manner in which this important feature of the device folds up parallel to

the frame, without interfering with the operator when he is traveling, is shown in the second photograph.





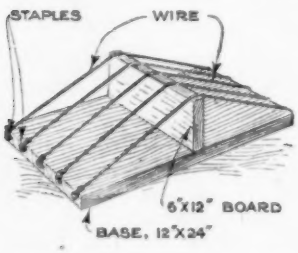
A Counterweight and Pulley, Fastened to the Porch, Makes It Easy to Move the Outfit Up and Down Steps. The Lower Picture Shows the Complete Equipment as Mounted on the Wheel

Much ingenuity has been displayed in designing the various accessories, which include a buffer and scratch brush, mounted on a third bicycle hub, upon which, at its center, a friction wheel is mounted. By means of an adjustable frame, which is clearly shown in the lower photograph on this page, these wheels can be brought down to make contact with the grinding wheel, so that polishing and cleaning can be done without the operator changing his position. A level is mounted on the table to enable the owner to set up his machine accurately, while a small vise, pivoted to one corner of the stand, is used to hold a fine-grained oilstone. When not in use, the vise is swung around out of the way. Convenient holders are provided on the table for two socket wrenches and an oil-can, other tools being carried in a case attached just underneath the water can, which is provided with a petcock to drip water onto the grinding wheel.

The whole outfit cost its maker about $45, and two months of his spare time to complete. The total weight of the wheel and its attachment is about 80 lb., and while this is a rather heavy wheel, it has not been found hard to manage, except when carrying the outfit up and down stairs to the room in which it is kept. To overcome this difficulty a counterweight and pulley have been rigged up in the corner of the porch. When the rope fastened to the counterweight is hooked at the front of the bicycle, it is a very easy matter to move the outfit up or down the steps.

## A Wire Boot Scraper

A most efficient boot scraper can be made from two boards and a few feet of strong wire. A T-shaped support is made by nailing the two boards at right angles to each other. The upper edge of the perpendicular board is notched to keep the several wires from shifting their positions. One end of each wire is fastened to one end of the horizontal board with staples, the wires being then drawn up tightly across the vertical support and made fast with staples to the opposite end of the base. When the foot is drawn across the taut wires, the mud is scraped off and falls onto the base.

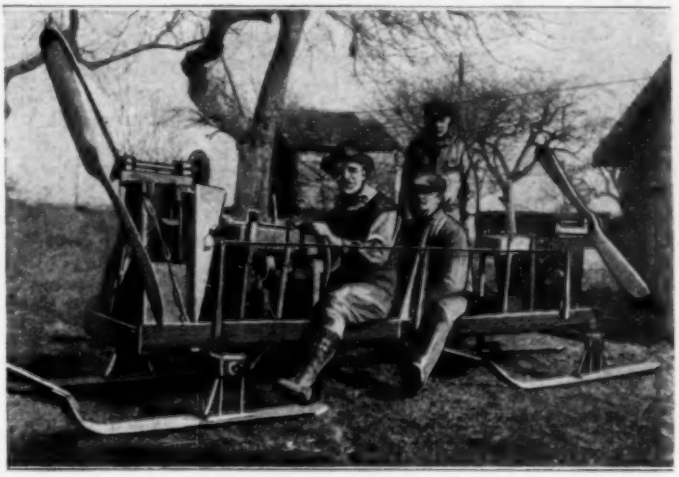



## Cleaning Furnaces

In cleaning out furnaces of the pipeless or hot-air types, an automobile-speedometer shaft, about 6 ft. long, can be used to reach parts of the furnace, such as the radiator, that are inaccessible to the usual cleaning tools. A brush is attached to one end and a round can fastened a short distance behind it. In use, the arrangement, brush first, is pushed around the smoke flues, the brush dislodging the soot and dust and the can collecting and removing it.

### A Powerful Aero Sled

Something a little different from the usual type of air-propelled sled—one that uses two propellers instead of one—is shown in the photograph. This particular vehicle uses both "pusher" and tractor propellers and is designed for use on hard-packed snow or ice. Two motors, one for each propeller, of the ordinary twin-cylinder motorcycle type are used, the motors being bolted to the frame of the sled. Brackets support the countershaft bearings and give the proper clearance to the blades. One end of each countershaft is bolted to the propeller, and sprocket wheels are keyed to the opposite ends, as the propellers are both driven from the motors by sprockets and chains. The speed of both motors can be controlled by a single lever within easy reach of the driver, and separate fuel tanks are provided for each engine. The frame of this aero sled is made from two spruce sticks, about 12 ft. long, with ash crosspieces. The runners are made like skis, and have steel shoes underneath to prevent skidding. The front propeller is 5½ ft. in diameter, and the rear one is 4 ft. 10 in. The forward propeller is geared to run at about 1,100 r.p.m., while the one aft turns at from 1,300 to 1,400 r.p.m., so that even though it is in the air stream of the forward propeller it will take a good grip on the air.



A Powerful Aero Sled That Uses Fore and Aft Propellers, Driven by Separate Engines of the Twin-Cylinder Motorcycle Type

This sled is very strongly built and has great speed, with a passenger capacity of three. Wire guys, fitted with turnbuckles, are used throughout the entire structure to keep the frame and mechanism rigid.—C. S. Greene, New York, N. Y.

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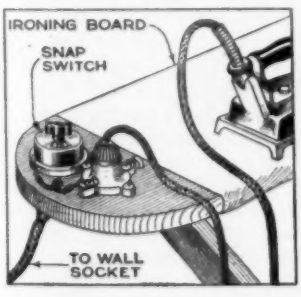
### Indicating Switch for Electric Irons

In order to prevent wear on the electric-iron plugs, and at the same time have some convenient means of controlling the current as well as knowing when the "juice" is turned on or off, an indicating snap switch and keyless porcelain socket may be permanently fastened to the ironing board. Connection is made to the source of current by means of a suitable length of cord with a plug, which is attached to the snap switch on the ironing board. This arrangement makes it unnecessary to pull the plug from the iron, and besides, the cord hangs down from the board instead of being in the way, as it is when connected to an overhead lamp.—K. L. Martin, Cleveland, Ohio.

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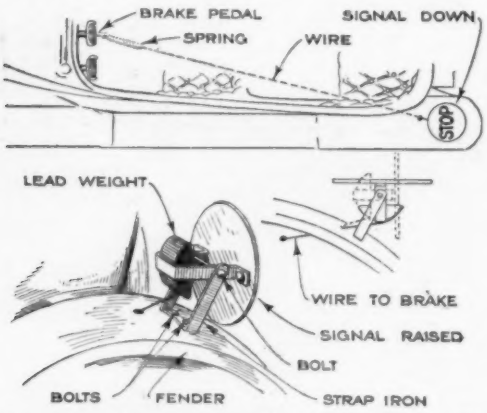
### Cotter Pin Aids in Tube Repairs

When a tire is punctured and the inner tube deflated, it is necessary to pump up the tube to locate the hole. When the hole is located, the air is let out through the valve so that the tube can be cemented and patched. A simpler way than removing the inside of the valve or depressing it, is to insert a cotter pin into the puncture. The ends of the cotter pin are spread apart to distend the sides of the hole, and it is then an easy matter to force the air through the enlarged opening. Also, the application of a little patching cement to the inside edges of the hole makes a better job, and with the cotter pin holding the hole open, this is easy to do.

### A Simple Rear Signal

The "stop" signal illustrated is designed to be attached to the left rear fender of the car. It is connected to the service-brake pedal so that the slightest forward movement of the pedal will swing the circular target to a perpendicular position and display its warning. The sheet-metal disk is provided with a weight, which is attached to it by a bracket, as indicated in the drawing. Another bracket is bolted to the fender to support the weighted disk. Normally, the weight will keep the disk in a horizontal position, and operation of the brake pedal is required to make the device show its warning; this is accomplished by means of a wire, running from the weight to the brake pedal. To compensate for wear of the brake bands, which allows the pedal to move forward a greater distance, a coil spring is attached, as indicated. A signal of this character is of special value to truck drivers, where the rear view is obstructed by the body.




An Automatically Operated Warning to the Car Behind That the Driver Intends to Stop or Slow Down is Operated by Pressure on the Service-Brake Pedal. Normally the Warning "Stop" is Not Displayed

### Electric Iron Used as Vulcanizer

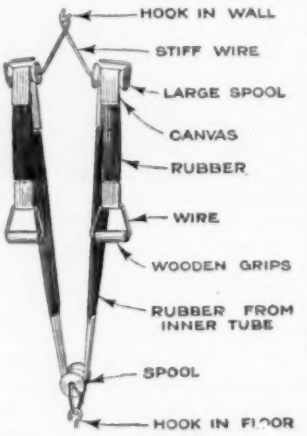
Tube vulcanizing is expensive, and often a new tube is discarded because of a single blowout that is too large to be covered with a cold patch. To be sure, there are various types of vulcanizers that are to be had for a small sum, but as a rule they are mussy and inefficient, often ruining the tube beyond repair, and with small gasoline vulcanizers, there is the added danger of fire.

A safe and reliable vulcanizer that covers a large area can be made by removing the handle from an electric flatiron and using it as the heating unit. Inner tubes can then be vulcanized anywhere that current is available. A repair can be made very close to the valve without removing it, and any size of hole can be mended by making one or more settings of the iron. It is advisable to try out the vulcanizer on an old tube first. In making a repair, always powder the patch with soapstone, or French talc, and lay a piece of paper over it before applying the vulcanizer. This will prevent the hot iron from sticking to the tube.

A short piece of iron, with holes bored in one end, screwed on in place of the handle, will make the removal of the hot iron an easy matter. In use, the electric-iron vulcanizer is clamped to the tube with one or more ordinary C-clamps.—Glen F. Stilwell, Collinsville, Ill.

### A Homemade Exercising Machine

Old inner tubes, and some stiff wire or iron rod, together with three large spools, are the materials used for making a home exerciser at insignificant expense.

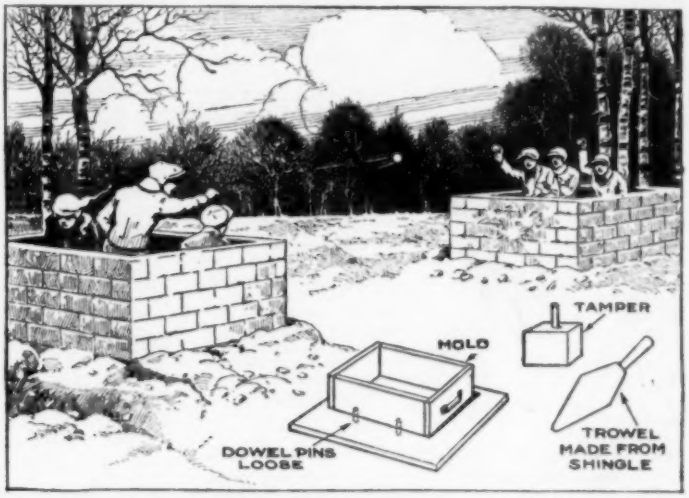



The rubber is cut into strips, 2 in. wide and of the length desired, two or more of the strips being cemented to each other, as may be desirable. Where the bands pass over the spools, canvas is used instead of rubber, on account of the wear. The pieces of canvas are sewed along the edges and turned inside out to make a flat tube the same width as the rubber bands. The ends of the rubber strips are covered with rubber cement on both sides, inserted into the canvas, and weighted down until thoroughly dry. The arrangement of strips, spools, and hooks is clearly shown in the drawing.

¶ Any discoloring matter in water will stain a water gauge glass and make it difficult to see the water level. When it becomes necessary to clean the glass use hydrochloric or muriatic acid.

### Making Snow Building Blocks

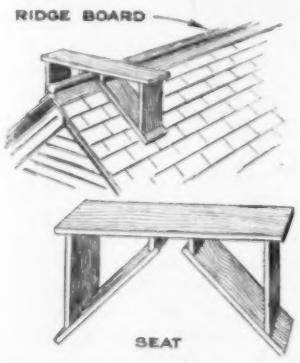
Forts, Eskimo igloos, and other buildings can be made quite elaborate architectural accomplishments if constructed of snow building blocks. The snow is compressed in a simple rectangular wooden mold, which produces a block about the same size as the standard concrete block, or 8 by 8 by 16 in., although any other size or shape may be produced by altering the mold. The mold is placed on a flat surface, filled with snow that is tamped down hard, and the snow struck off level with the mold top. After the snow has been sufficiently compacted, the mold is removed, and the block is set aside until a sufficient number have been made to complete a fort or other structure. In building, the blocks are held together by a "mortar" of wet snow or slush, which, when frozen, unites the building into one solid mass. The trowel used for spreading the mortar can be made from a shingle or piece of board.—John L. Dougheny, Toledo, Ohio.




**Forts Erected with Building Blocks Made of Snow: The Blocks are Molded in a Wooden Form and Then Laid in a Mortar of Wet Snow, Which, When Frozen, Unites the Building into One Solid Mass**

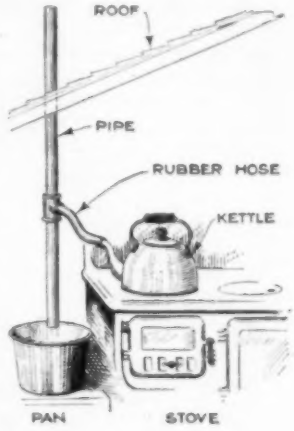
### Comfortable Ridgepole Seat

The drawing illustrates a device that can be used to equal advantage by carpenters and others doing work on the ridge of a roof. The seat is made from a board 2 ft. long, which is supported in a horizontal position by braces at each side. Naturally, the length of the perpendicular supports will vary more or less to correspond to the pitch of the roof. A seat of this type can be moved forward or backward while the worker is sitting on it, and the fatigue caused by assuming uncomfortable positions is thus obviated. Such a seat is also a safety device for the worker, that will materially reduce the possibility of accident either to himself, or to those below from falling tools.—Augustus C. Hausman, New Haven, Conn.



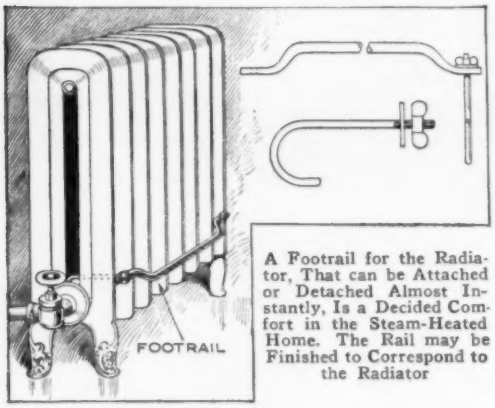

### Making Alkaline Water Drinkable

Settlers in parts where the water is alkaline find it difficult to get water that is fit to drink, as it must be distilled or otherwise purified. The illustration shows an easily made condenser that is often used for this purpose, consisting of nothing more complicated than a length of iron pipe provided with a tee in the center, and passing through the roof of the house. The spout of a teakettle is connected to the tee by a short length of hose. When the water in the kettle boils the steam will issue into the iron pipe where it will condense into drops on the inside, the distilled water dripping into a pan.



### A Footrail for the Radiator

A quickly detachable footrail that can be used on any type of radiator, can be made from a piece of ½-in. pipe or iron

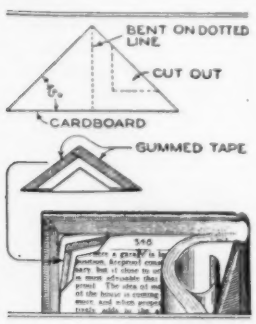



A Footrail for the Radiator, That can be Attached or Detached Almost Instantly, Is a Decided Comfort in the Steam-Heated Home. The Rail may be Finished to Correspond to the Radiator

rod, although the former will probably be found to be stiffer. A piece of pipe of suitable length is bent to the form shown, and the ends are flattened and drilled to take the threaded ends of hooks made of iron rod. These hooks, or clamps, are hooked over the inner part of the radiator between the sections. The threaded ends are inserted in the holes provided in the ends of the rail, which is held rigid by the application of washers and wingnuts.—B. Francis Dashiell, Dunkirk, Md.

### Practical Bookmarkers

A bookmarker that is free from the many objections of most types and that slips over a corner of the page is very simply made. Cut a square of rather thin cardboard, about 2 in. on a side; cut along one diagonal, and place the resulting two triangles together. Now cut two 2-in. pieces of gummed tape and use them to fasten the short edges of the paper triangles together. Finally, cut a small notch in the middle of the long edge of one of the triangles and fit the completed bookmark over the corner of a stiff card, to clear out any paste or gum that might remain between the two triangles.




To use this bookmark attach it over the corner of the left-hand page of the book on the upper side of the leaf. Do not try to catch more than one leaf in the bookmark, for it will then be sure to come loose when the book is opened. It is a good idea to see that the notched side of the marker always indicates the side where the "place" in the book is.—Curtis Ralston, Springfield, Ohio.

### Transferring Printed Pictures

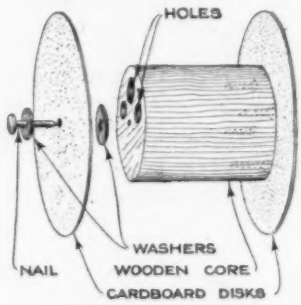
This method may be used for transferring the pictures printed in papers and magazines to paper and fabric for various purposes.

Dissolve a bar of common soap in 1 gal. of hot water and add ½ pt. of turpentine. Allow the mixture to stand overnight, stir well, and bottle, after which it is ready for use.

The solution is applied to the face of the picture it is desired to transfer, with a brush or tuft of cotton. A piece of clean cloth or paper is laid over the picture and firmly rubbed with the bowl of a teaspoon, or a similar smooth article.

### The Eccentric Spool

A very simple toy will interest the young folks because of its eccentric conduct and movements when rolled, and because of the unusual principle involved. All that is required is two heavy cardboard disks, and a section of curtain pole about 1⅜ in. in diameter. One disk is permanently tacked to the end of the wooden core, while the other is attached so as to revolve freely. Three holes, one ½ in. in diameter and two ¼ in. in diameter, are drilled all the way through the wood parallel to the center. A washer is provided on each side of the revolving disk to prevent it from binding; this and the holes drilled through the crosspiece are responsible for the unexpected spins and turns that the spool automatically performs when rolled. A very slight push makes it do this; a hard one will send it rolling in a straight line.

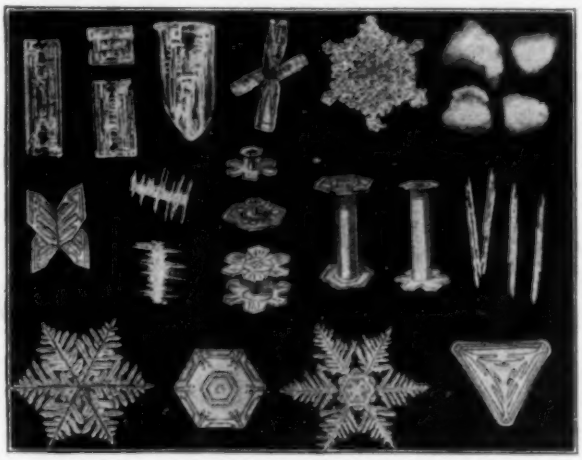


# PHOTOGRAPHING SNOWFLAKES

By W. A. Bentley

EVERY snowflake has an infinity of beauty which is enhanced by the knowledge that the investigator will, in all probability, never find another exactly like it. Consequently, photographing these transient forms of Nature gives to the worker something of the spirit of a discoverer. Besides combining her greatest skill and artistry in the production of snowflakes, Nature generously fashions the most beautiful specimens on a very thin plane so that they are specially adapted for photomicrographical study.

The photographing of snowflakes, although quite delicate work, can hardly be called difficult, although some hardships attend it, because the work must all be done in a temperature below freezing, and under conditions of much physical exposure. The temperature at which photography is possible depends somewhat upon the thickness of the crystals; this varies greatly from time to time, and depends upon whether the temperature is rising from an intense degree of cold or falling from a point above freezing. If rising after a cold snap, photographing can often be continued until actual thawing commences.



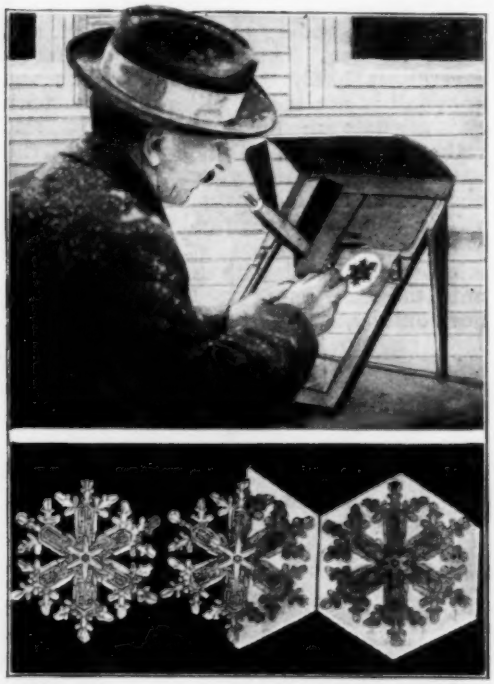
**A Variety of Strange Forms of Snow Crystals: The Specimens near the Center Are of the Most Interest on Account of Their Rarity**

Of course, location is everything in this work, and no one except those living in arctic climates or in regions having long and severe winters, can accomplish very much. Generally speaking, the western quadrants of widespread storms or blizzards furnish the most beautiful and perfect forms. At such times the wind is usually westerly or northerly, with the barometer standing at 29.6 to 29.9 in. and slowing rising. The percentage of perfect crystals is likely to be larger when the snowfall is not too thick and heavy, with the crystals medium to small in size rather than large. The character of the snowfall often undergoes quite abrupt changes as a storm progresses.

The apparatus required for snowflake photography consists of a compound microscope, fitted with a joint that permits the instrument to be turned down horizontally, at right angles to its base, so that it can be coupled to a camera bellows by means of a light-tight connection. The microscope objectives are used alone, without the eyepiece. It is best to have several different objectives; ½, ¾, and 3-in. combinations, which give magnifications of from 8 to 60 diameters (64 to 3,600 times), will serve well.

Ordinary daylight, coming through a window, is used for illuminating the crystal after it has been placed on a microscope slide, a tiny beam of light entering through the small aperture in the substage of the instrument. The apparatus is placed indoors, near by and facing a window. The room, the apparatus, and its accessories should always be away from any source of artificial heat, and at a temperature approximately that of the outside air. The necessary accessories are an observation microscope, a pair of thick mittens, microscope slides, a sharp-pointed wooden splint, a feather, and a turkey wing or similar duster; also, an extra focusing back for the camera, con-

taining clear glass instead of the usual ground glass, with a magnifying lens attached; this is used for final focusing. A blackboard, about 1 ft. square, with stiff wire or metal handles at the ends, so that the hands will not touch and warm it, is used to collect the specimens. As it is necessary to cover the end of the microscope objective with a strip of black card, that takes the place of the usual



Blocking Out the Snow-Crystal Images on the Photographic Negative: Right, Original Negative; Center, Negative Partly Blocked Out; Left, Completely Blocked-Out Negative

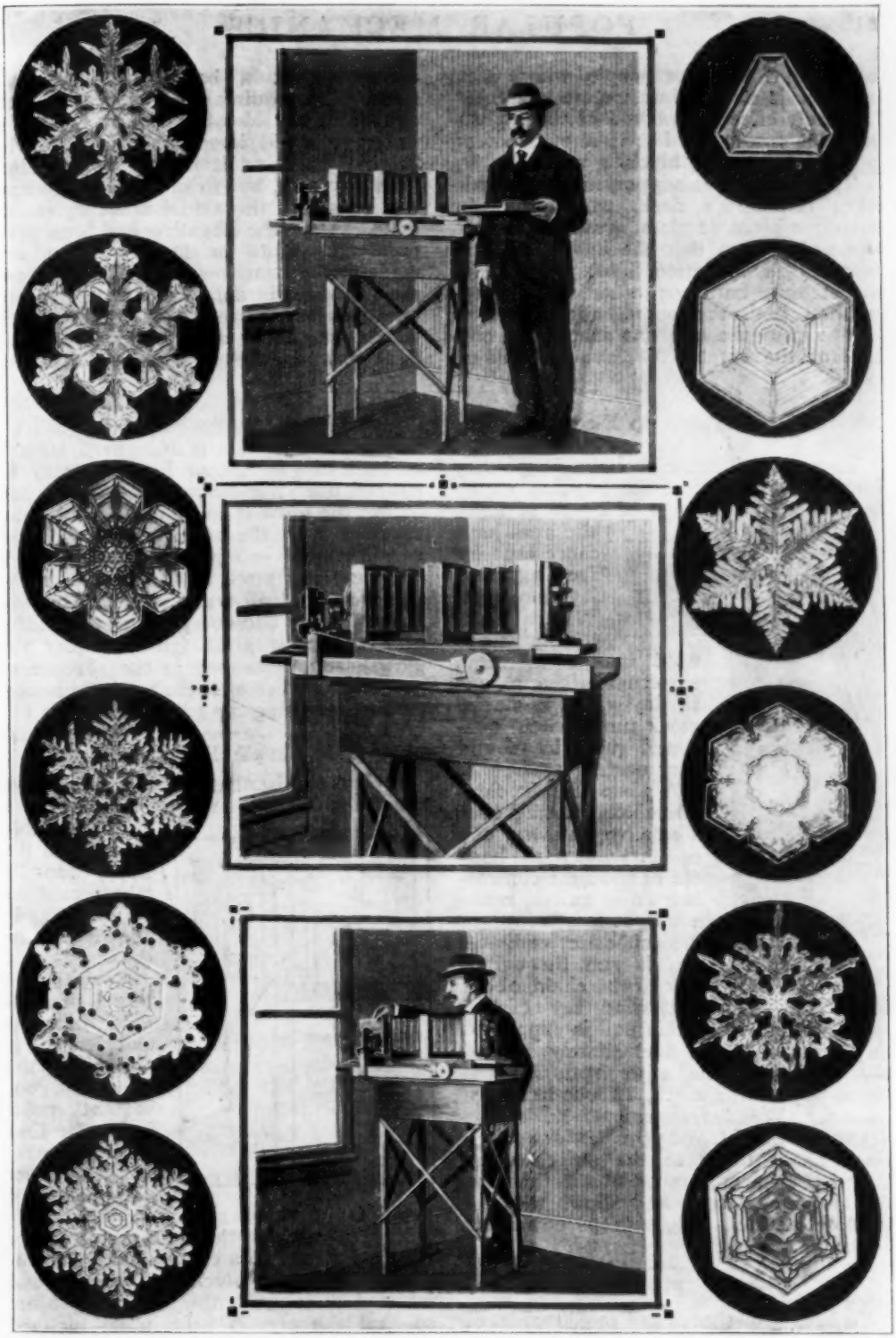
camera shutter which controls the duration of exposure, it is necessary to fit two vertical rods at each side of the microscope tube to hold the card.

The snowflakes are caught on the blackboard as they fall, and examined by the naked eye or with the assistance of a hand magnifying glass. The feather duster is used to brush the board clean every few seconds, until two or more promising specimens alight upon it, when it is immediately removed indoors. From this point onward the photographer must work fast. The promising specimens are placed for a moment's observation under the observation microscope. The removal of the snowflake from the board to the microscope slide is accomplished with the sharp-pointed splint, which is pressed gently against the face of the crystal until the latter adheres to it, so that it can be picked up and placed on the glass slide. Usually several crystals are placed together on a single slide, a momentary glance being given to each, and care taken while doing this not to breathe on the crystals. The utmost haste must be used, for a snow crystal is often exceedingly tiny, and frequently not thicker than heavy paper. Furthermore, once these bits of pure beauty are isolated, evaporation (not melting) soon wears them away, so that, even in zero weather, they last but a very few minutes. When a desirable specimen is obtained, it is pressed flat against the glass with the edge of the feather and the slide inserted in the stage of the microscope on the camera stand, centered, roughly focused with the camera ground glass, then sharply focused with the clear-glass screen and magnifier, focusing on some tiny air tube near the center of the crystal. The plate holder is then inserted into the camera, the objective covered with the black card and the slide removed from the plate holder. The objective is then uncovered, and when the exposure, which may vary from 8 seconds to 100 or more, is deemed sufficient, the operation is reversed. Naturally enough, no rule for the length of exposure can be given, except that the greater the magnification, the longer the exposure should be.

The frail, feathery flakes are the most difficult to photograph, and it is always best to place five or six other crystals around the specimen, as this greatly retards the evaporation of the central one.

When working from the rear of the camera, and the bellows extension is such as to make it impossible to reach the focusing screw on the microscope, an arrangement similar to that shown in the page illustration can be used. This consists of a cord that runs over a wheel on each side of the camera and around the focusing screw. No lens is required in the camera, the microscope furnishing the optical equipment for projecting the images onto the sensitized plates.

Having recorded the fleeting substance of the snowflakes on the photographic negative and brought out the image by development, the photographer discovers that the body of the snow crystal is so transparent, that it does not contrast enough with its background to make a print in which the form will stand out in relief. There is no purely photographic method for producing the white images against a dark background, and yet it is necessary to do so if the images are to be



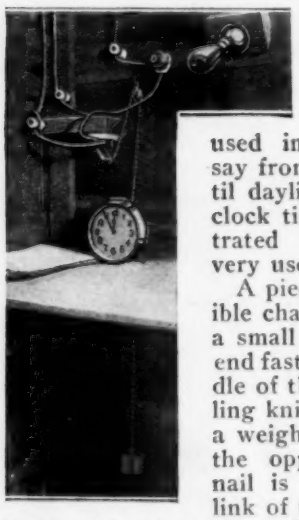
The Apparatus Used for Photographing Snowflakes and Some of the Specimens Selected. Above: The Author Holding the Tray on Which the Snowflakes are Collected. Center: A Cord That Passes over the Microscope Focusing Screw and Wheels at Each Side of the Camera Makes Sharp Focusing Possible. Below: Inserting the Transparent-Glass Microscope Slide, on the Surface of Which Is One or More Snowflakes, into the Microscope Stage, Preparatory to Photographing

appreciated by most people, whose ideal of snow is that of immaculate whiteness. The only effective method of accomplishing this result is what is known among photographers as "blocking out."

The negative is supported on an ordinary retoucher's desk, which may be merely a piece of glass, arranged to hold the negative so that the image is illuminated by transmitted light. Then, with an etching knife or other fine, sharp-pointed tool, the operator proceeds to scrape away the emulsion around the outline of the crystal to leave it standing alone against a background of clear glass. This requires considerable patience, and often considerable time as well. In order to avoid irreparably spoiling the original negative, it is best not to alter it in any way, but to make a copy negative on which the actual blocking out is done. After the negative has been thus prepared, prints or lantern slides are made in the usual manner. Blocking out the negatives is done indoors, instead of outdoors as shown by the photograph, which was thus taken to get sufficient light to allow the exposure to be made.

### Alarm Clock Turns on Electric Lights

The use of artificial light in poultry houses has become quite popular, as, by increasing the number of hours of light, the hens have more time for feeding, and lay more eggs. Where electric lights are used in the morning, say from 4:00 a. m. until daylight, the alarm-clock time switch illustrated will be found very useful.



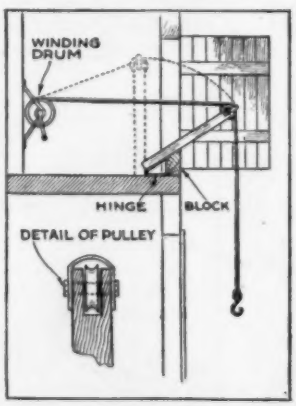
A piece of light, flexible chain, passing over a small pulley, has one end fastened to the handle of the light-controlling knife switch, while a weight is attached to the opposite end. A nail is run through a link of the chain, about level with the alarm-wind key of the clock. One end of this nail is supported on a small block immediately behind the clock and the other rests on the alarm key of the clock, after it has been wound. This arrangement holds the chain and weight, and provides for enough slack chain to leave the switch open. When the alarm goes off at the time set, the alarm key turns and allows the nail to slide off; the weight drops down and closes the switch.

### Cleaning Plowshares

To keep plowshares and moldboards, as well as cultivator shovels, from rusting during the time they are laid up, it is best to give them a liberal coating of some thick grease. If the grease hardens on the surface so that its removal is difficult when the implement is to be used, a small amount of gasoline or kerosene may be poured over the share, and ignited just before the plow is to be used. The heat, together with the solvent action of the gasoline, will soften the grease, and if the plow is started in the ground while the grease is still warm, the coating will peel off easily and completely. A handful of dry hay or grass ignited under the plowshare will answer in the absence of gasoline. Either of these methods is better than scraping the grease off.

### A Simple Farm Hoist

A simple hoist that will find many uses about the farm, for raising bags of grain and other bulky weights to the upper floor of a barn or other building, is shown in the drawing.




A wooden beam, of suitable thickness and length, is hinged to the floor at a convenient point inside the door or other opening. The upper end of the beam is provided with a single-sheave pulley, over which the rope passes to the winding drum; this can be easily improvised. A wooden block can be made and inserted underneath the projecting beam so that the arm is held in an inclined position, as shown. The packages are raised clear of the building and, when they reach the pulley, swing inward as the arm rises to a vertical position.

### Increasing Tone of Phonograph

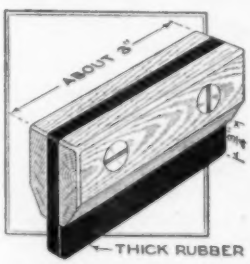
"Extra-loud" phonograph needles are furnished that have a comparatively blunt point so that none of the amplitude of the vibrations is lost as in the long and tapering "soft-tone" needles. When it is desired to obtain a still greater volume of sound, these extra-loud needles can be shortened by breaking off about one-third of the needle at the blunt end. This is done by holding the needle in two pairs of pliers and bending it. The needles are hardened and will break easily. The shortened needle is secured in the reproducer and permitted to protrude just enough to allow the other parts of the reproducer to clear the record. The greatest possible volume of sound is then obtained from the records for playing dance music or piano records.—Chas. I Reid, Millersburg, Pa.

### Cheap Soot Removers

To clean out stovepipes and furnace flues of an accumulation of soot without trouble or muss, is entirely possible by the use of common materials. Metallic zinc is one of these soot-removing agents, and it can be used in any form, such as old tops from fruit jars, old washboard coverings, dry-cell cases, and the like. In the case of the last-named, a particularly pleasing effect is obtained when an old dry cell is dropped into the flames of an open fire, which produces a delightful play of colored light. A handful or two of salt thrown into the furnace is also good for removing accumulations of soot. —Cora Hamilton, Binghamton, N. Y.

### Scraper for Dinner Plates

A little convenience for the kitchen that will save a considerable amount of labor is the easily made scraper shown in the drawing. A sheet of thick rubber is clamped between two hardwood blocks of the proper dimensions with ordinary screws. One or two passes of such a scraper over a dish cleans off practically all grease and other remains much more quickly and effectively than is possible by the use of a knife or similar implement.




### Sled Runners for the Baby Carriage

Four pipe tees, and suitable lengths of pipe, bent upward at the ends, are the only materials required for a set of detachable runners by means of which the baby carriage can be converted into a sleigh in a few minutes.

A Pair of Gas-Pipe Runners for the Baby Carriage Makes It Almost Instantly Convertible into a Sleigh for Snowy Weather. It Is Only Necessary to Remove the Wheels and Slip the Runners over the Axles

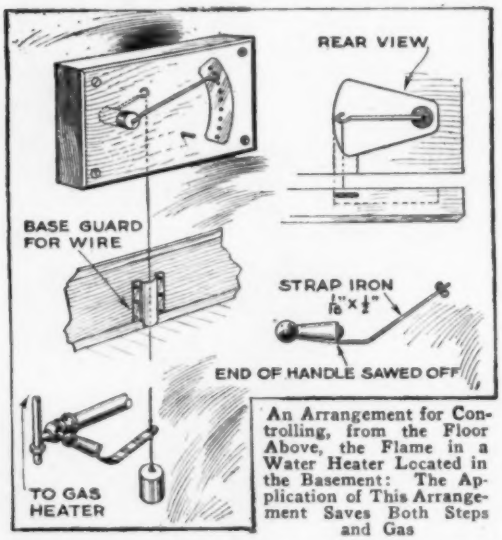
To attach or detach the runners, it is only necessary to remove the nuts and washers that hold the wheels, slip on the runners and replace the nuts, although in some cases it is possible that larger washers will be needed on each side of the tee, to hold the runners rigid when the nut is turned down. If some form of catch is employed instead of nuts to hold the wheels, it may be necessary to cut a groove in the inner ends of the tees to take the catch. This is easily done, however, and will not worry the amateur mechanic. The size of the tees used, and, therefore, the pipe size, will be determined by the diameter of the axles.—Clare B. Smith, Chicago, Ill.

### Stiff Collars Made into Soft Ones

Most stiff linen collars are discarded at the slightest sign of wear, although in this condition they can be made to give weeks of extra use by converting them into soft collars. This is done by boiling out all the starch, making neat repairs where needed, with silk thread, and laundering in the usual manner for unstarched work.—S. S. Sutherland, Detroit, Mich.

### Step-Saving Water-Heater Control

The water-heater regulator illustrated is one that has resulted in saving many steps between the first floor and basement




An Arrangement for Controlling, from the Floor Above, the Flame in a Water Heater Located in the Basement: The Application of This Arrangement Saves Both Steps and Gas

of a residence, and that has also effected a saving in the amount of gas consumed. The construction of the regulator is simple, and involves nothing that cannot be made by the home mechanic. An extension is attached to the gas-cock handle, as indicated, and this is connected by a wire to the controlling arrangement on the upper floor. The controller consists of a U-shaped wire lever mounted on a wooden block attached to the wall. One end of the lever is bent at right angles, and its position is adjusted and maintained by inserting this projection into holes drilled in a metal plate and into the block. A weight is attached to the underside of the valve-handle extension, so that should the wire break, or the lever become loose, the gas will be turned off automatically.—Donald W. Clark, Buffalo, N. Y.

### A Hint for the Auto Painting Job

When the automobile is given a coat of paint at home, the most important thing is to keep dust from settling on the paint before it has dried. The old finish should be sandpapered and carefully wiped off, to make the surface as smooth as possible and remove all dust and dirt. Before applying the paint, tack paper over all cracks and crevices in the garage that might let in dust from the outside; then, if an especially dust-free job is desired, make a frame of light lath, big enough to stand on the floor and cover the car and at the same time leave room to work. Cover this frame with thin paper—light will come through the paper but dust will not. Save a new brush and an unopened can of varnish for the finishing coat on the body and fenders, and when the painting job is completed, do the finishing work under the covered frame.—J. Paul Suter, Youngstown, Ohio.

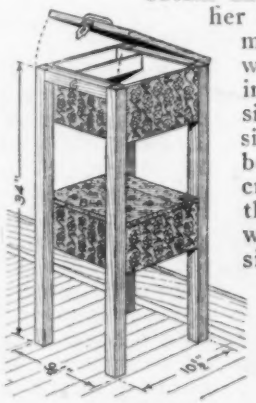
### Removing Wire Wheels

Owing to a puncture, it was found necessary to remove one of the wire wheels on a new automobile that had been driven only a few hundred miles. The nuts on the wheels had been set up very tight, and it was found impossible to unscrew them by simply pulling on the spanner wrench, with the wheel jacked up. The nut was finally unscrewed by the following method:

The jack was removed and the spanner set on the nut so that its handle was horizontal; then the jack was set under the end of the handle. By "pumping" on the jack, the end of the handle was raised slowly, while the wheel revolved, slipping over the road surface. By proceeding in this manner, the nut was loosened sufficiently to enable it to be entirely unscrewed without difficulty by turning the spanner by hand.

### An Easily Made Sewing Stand

The sewing stand shown in the drawing is the outcome of a woman's inability to obtain an article suitable to her requirements. It is made from two wooden cocoa-packing cases of the same size. After the outside of the boxes had been covered with cretonne glued to the wood, hinged lids were provided and similarly covered. The wooden legs are about 1-in. square, and are fastened to the boxes from the inside, with screws. The top section is provided with a neat brass hasp so that it can be locked.—T. H. Lynn, Hyattsville, Maryland.



### Cleaning Ceilings

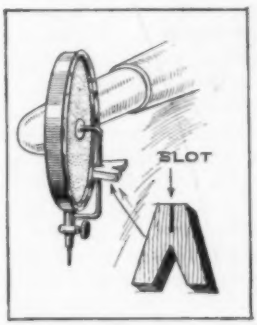
To clean smoke, dirt, grease, fly specks, etc., from a painted ceiling or wall, make a mixture of vinegar, baking soda, and a little table salt, and rub the grimed surface with it. Follow by washing off with warm water and soap, and wipe dry, using a soft rag. This method is also good for enameled baths, glass, and white porcelain.

### Test for Water in Gasoline

Water will "lick" molasses off a stick, gasoline will not; and water, being heavier than gasoline, sinks to the bottom of a tank. On these principles a simple test for water in gasoline has been evolved by a state inspector. A stick is coated with molasses and plunged into a gasoline tank. If there is water present it will show up as a bare section on the gauge when withdrawn, the length of the bare wood indicating the depth of water. —Hjalmer Lindquist, Minneapolis, Minn.

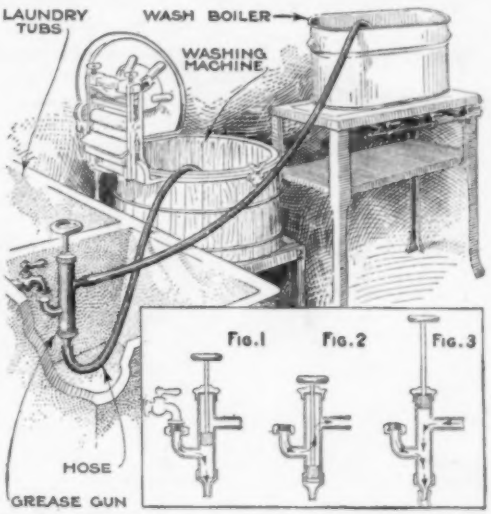
### Softening Tone of Phonograph

The attachment shown in the drawing is cut from a piece of thick sheet rubber, leather, or similar flexible material, in the form shown, and fitted over the needle bar of the phonograph reproducer to subdue the tone of the instrument. In applying or removing the "mute," for such it properly can be called, the ends are pressed together by the fingers; this expands the slot in the opposite side and makes its application or removal very simple.




### Laundry Siphon Made from Grease Gun

A washing machine or boiler can be filled or emptied easily and without dipping the water by means of the novel siphon shown in the drawing. An ordinary grease gun was obtained and elbow and hose connections were brazed to the side of the cylinder. The siphon is screwed to the laundry-tub faucet, and, with the piston in the position shown in Fig. 1, the water flows through the nozzle at the bottom and may be conducted into any receptacle, or used, with the hose removed, for filling the stationary tub. With the piston in the position indicated in Fig. 2, the water flows through the upper tube. To drain the washing machine or boiler, it is only necessary to raise the piston to the position shown in Fig. 3 and turn on the water, which will suck the dirty water out into the stationary tub.—J. G. Brown, Evanston, Ill.

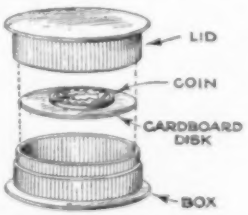



**By Brazing a Hose Connection and Nipple to the Cylinder of an Ordinary Grease Gun, a Laundry Accessory is Produced That will Drain or Fill the Washing Machine, Boiler, or Other Vessels**

### The Magic Pill Box

The magic pill box makes coins disappear and return at will; the trick is very simple, and any pill box can be fixed for performing it in a few minutes.

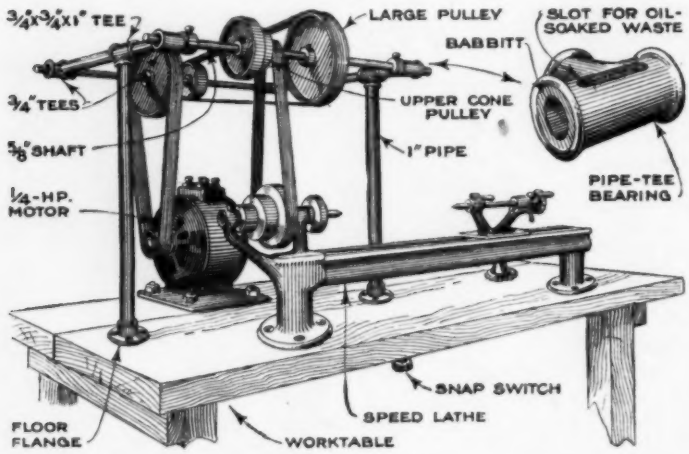
Get a regulation round pill box, and cut a cardboard disk just large enough to fit into the bottom. Drop a coin in the box and put the lid on; then, turn it upside down and shake it, calling attention to the fact that the coin is still there, by the rattling inside. Now, pull the box apart, holding the lid in the left hand, so that the cardboard disk covers the coin, which has vanished. Then, still holding the lid upside down, put them together again and reverse the operation, holding the bottom in the right hand; upon opening the box the coin will reappear.



# A Small-Lathe Countershaft

By J. V. ROMIG

INSTALLING a small bench lathe in the shop of the experimenter or model maker, has caused many an amateur mechanic to lie awake nights figuring how to avoid overhead countershafts, with their attendant long belts, particularly when the lathe is to be operated by a small electric motor. A system that has been satisfactorily used for several such installations eliminates entirely the countershaft fastened to the ceiling, and substitutes for it an easily constructed and economical arrangement made of iron pipe, and secured to the bench as shown in the drawing.




**Setting Up a Small Bench Lathe in the Experimenter's Shop is Accomplished without the Use of an Overhead Countershaft. The Countershaft is Supported on an Easily Made Standard and Bearings Made of Iron Pipe and Fittings**

Two lengths of 1-in. pipe of the proper length form standards for supporting the countershaft; one end of each is fitted with a floor flange, the other with a ¾ by ¾ by 1-in. tee. Pipe nipples of the proper length are screwed into the tees, and a ¾-in. tee is screwed onto each end of the T-shaped assembly of pipe and fittings; these latter tees are lined with babbitt for shaft bearings.

Slots are cut in each of the bearing tees and plugged with pieces of wood, which must reach to the shaft before the babbitt metal is poured; the blocks are later removed, and the resulting slot is packed with oil-soaked waste.

In pouring the babbitt bearings, the shaft is inserted into the tees and blocked up so that it will be central. The shaft is wrapped with a single thickness of paper to prevent sticking after the metal cools. Both ends of the tee are dammed to prevent the melted metal from flowing out; this may be done by fitting a cardboard disk over the shaft, against the end of the tee, and holding it in place with putty, or with a metal collar screwed against the tee. The opposite end is similarly dammed. A lip-shaped opening must be provided at the highest point of the dam for pouring the metal. If properly made, such bearings will require but very little aftertreatment to obtain a true-running bearing. The countershaft and its pipe standards are assembled, as shown in the drawing, with collars against the bearings to prevent end play.

For small lathes up to 6-in. swing, a ¼-hp. electric motor is perhaps the most satisfactory source of power, and this is bolted to the bench, back of the headstock. A snap switch of suitable capacity can be mounted at a convenient location underneath the bench, for controlling the operation of the motor.

If it should be undesirable, for any reason, to have the countershaft mounted on the top of the bench, several modifications of this arrangement are possible, and will suggest themselves to the builder. The same idea can be carried out by inverting the arrangement and bolting it to the underside of the bench, or to the floor under the bench, cutting slots on each side of the headstock and bringing up the belts from underneath.

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### Aid for Feminine Motorists

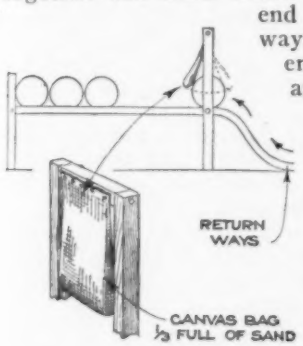
When motoring in a brisk breeze, many women are bothered by the problem of preventing the skirts of light and thin dresses from blowing up. With both hands occupied it is impossible for the feminine driver to keep tucking her skirts under her.

A clever girl conceived the idea of taking an ordinary paper clip and fastening the front and back hems of her skirt together after she had seated herself in the car. Thus, her limbs are left free to manipulate the foot pedals and her hands

can be kept where they belong—on the steering wheel. The slight weight of the clip, added to the fact that the front of the skirt is fastened to the back part, which does not sag down so far in the car, helps to hold the skirt easily, and there is no sense of weight or restriction of movement.—Ethel Van Cise, San Diego, Calif.

### Retarder for Bowling Balls

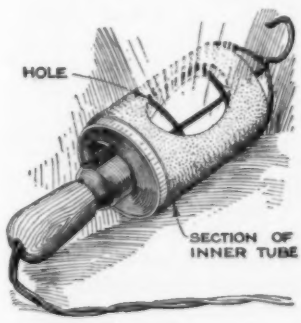
To prevent bowling balls from coming together too hard when they reach the end of the return ways, thereby shortening their life and making an unnecessary amount of noise, the proprietor of a set of alleys rigged up the retarder shown in the drawing.




Two upright pieces, connected by a crosspiece, were fastened to the sides of the ways, and from the crosspiece a canvas bag, about a third filled with sand, was suspended in such a manner that the bottom was in line with the center of the ball. The velocity of the ball is reduced when passing underneath the bag to such an extent that it rolls into place easily and almost noiselessly.—Geo. A. Volz, Monroe, Mich.

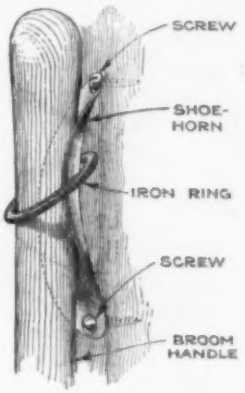
### Shade for a Trouble Lamp

To shade a trouble lamp that is protected from damage by a wire guard, a suitable piece of an old inner tube that has a hole cut in one side and pulled over the guard, as shown in the drawing, will serve very well. The hole can be cut to permit the passage of as much light as desired without having it shining into the workman's eyes. Besides serving as a shade, the rubber is also an additional protection for the bulb.



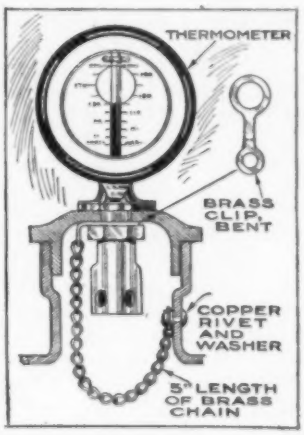

### Broom Holder Made from Shoehorn

An iron ring, such as is commonly known as a harness ring, and an ordinary shoehorn can be converted into a very satisfactory holder for brooms, mops, and similar round-handled articles. As shown in the drawing, this particular form of holder is simplicity itself; the ring is slipped over the small end of the shoehorn, both ends of which are then fastened to the wall with screws. Roughening the inside of the ring will improve its grip on the handle of the broom.—M. H. Bolsinger, Johnstown, Pa.



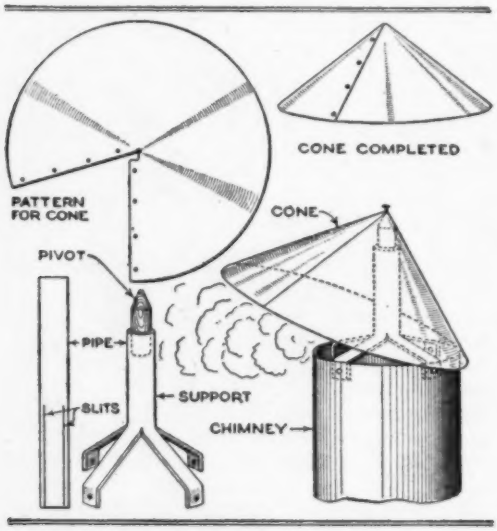

### Locking the Radiator Cap

Radiator caps of automobiles that are fitted with thermometers for registering the temperature of the cooling system, and for giving warning of overheating, are expensive enough to attract the attention of the "doormat" type of thief. A simple protective measure consists in attaching a short length of light brass chain to the instrument and the radiator-filler tube, in such a way that the cap can be unscrewed for filling the radiator, but cannot be dropped or carried away. A brass clip is cut to the form shown and screwed underneath the nut that holds the thermometer to the radiator cap. One end of the chain is fastened to this clip, and the other is riveted to the neck of the radiator. While it is possible to cut the chain with a pair of wire-cutting pliers, the thief, finding the cap secured, will more than likely seek easier booty.



### A Simple Stovepipe Cap

The chimneys of most summer kitchens are mere stovepipe extensions beyond the roof or walls of the building,




A Simple Cap for a Stovepipe Chimney That Not Only Increases the Draft and Prevents Water from Entering but Keeps the Stove from Smoking

and should be provided with rain caps, to prevent water from entering and causing them to rust rapidly. Stationary caps, while suitable for the purpose, cause the stove to smoke more or less in windy weather. Of course the location of the building in relation to surrounding structures has much to do with smoking chimneys and imperfect draft. However, the simple wind and rain deflector illustrated will insure against such annoyances.

A piece of 1-in. pipe, about 8 in. long, and a 12 by 12-in. sheet of heavy tin or galvanized iron, with a few stove bolts, or rivets, are the only materials required. The pipe is slit with a hacksaw to a depth of 4 in., as shown, and the four quarter sections thus made are bent at an angle to the remaining section, the bent part being heated to make the work easier and prevent breaking. The ends of the projections are turned down 1 in. from the end and drilled to take suitable bolts or rivets, as indicated. A wooden plug is driven tightly into the upper end of the pipe and tapered off as indicated. The standard thus made is bolted or riveted to the stovepipe.

The conical cap is cut from the piece of sheet metal provided, the edges being drawn together and riveted or soldered, and the completed cone is placed on the pivot and held in place by a nail driven into the wooden plug.

The slightest wind will operate the cap, causing it to tilt against the windward side of the pipe, so that the draft is increased and back drafts prevented.

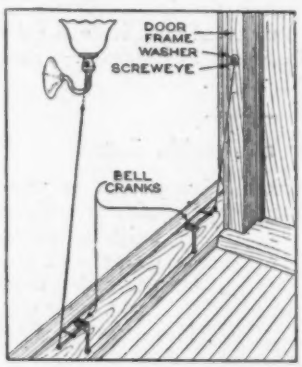
### Identification Mark on Tires

An aluminum slip on which the name of the owner is stamped can be placed in the mold when a section is being vulcanized into a tire, and provides a means for permanently marking the tire with the name of the owner pressed into the rubber. Nameplates of the type in question are produced by slot machines more or less generally located in public places and amusement resorts, and cost only a few cents. If desired, the name of the repairman can be used.

When the tire is ready for vulcanizing, the nameplate is placed in the mold, face out, and then the tire. The nameplate can be used indefinitely, and the same idea can be applied to a number of different methods of marking and identifying tires.

### Extension for Pull Chains

An inconveniently placed electric light can be quickly changed to be the most convenient in the whole house by using the idea illustrated, or some variation of it.




Two bell cranks, having 2½-in. arms, are fastened to the baseboard, and connected to each other and the pull chain of the lamp socket by means of a cord. Another cord is run up through a screweye on the door frame, and a washer tied to the end of the string to keep it from falling through. A small washer behind each of the bell cranks prevents them from binding against the wall.

Before this extension pull chain was installed, it was necessary to walk around the bed in order to operate the light, but with the extension, the light can be turned on from the doorway.

### Muting a Banjo

In the rendition of some selections, or under circumstances where the loud tone of a banjo is more or less objectionable, the instrument can easily be muted to give a more subdued tone. All that is necessary is two five-cent pieces; these are interposed between the ends of the bridge and head of the instrument.

### How to Build an Adjustable Bridging Condenser

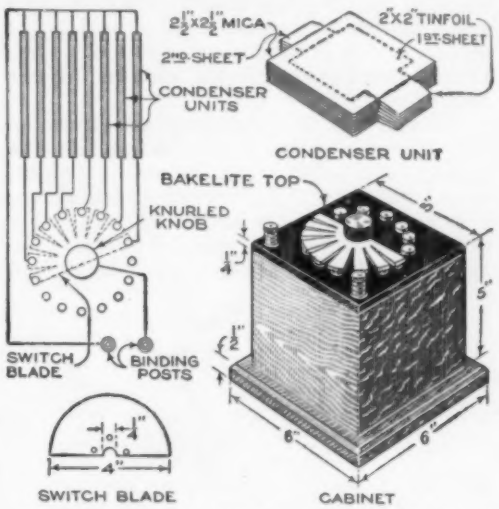
An adjustable bridging condenser for wireless work, that will serve as well as the high-priced manufactured articles on the market, can be built easily and economically. It will work in the ground lead in C. W. transmission sets, but when used for this purpose, the mica should be of the best quality, and all units, when clamped together, should be tested out with 500 volts of direct current before installation. This condenser works nicely in receiving sets, and can be made in various capacities, which are cut into and out of the circuit by the fan switch.

The eight condenser units are made up of 2-in. squares of tinfoil, clamped between 2½-in. square mica sheets. Make one unit with five sheets of foil and the remaining seven with three sheets of foil each. The foil sheets are cut out with a tab at one edge which projects beyond the mica plates.

In assembling the first unit, a mica sheet is laid on the table, a tinfoil sheet placed on it with the tab projecting to the right, another mica sheet placed on top, and the next tinfoil sheet placed with the tab pointing to the left, and so on until the five sheets of foil and six sheets of mica are assembled. The remaining units are assembled in the same manner, the tabs of the alternate sheets being brought out at opposite sides.

After assembling each unit, bind it with electrician's tape, or bolt the whole number of units together between metal plates and impregnate with paraffin. The foil tabs are all brought together at the ends and a lead wire soldered to each, the whole being bridged at the back, as shown, and the leads brought out to contacts in the bakelite top of the cabinet; 16 points are used, eight of these are idle or dead taps, and merely serve to carry the switch blade smoothly. The switch blade is formed from sheet aluminum and screwed to the underside of the switch knob. If sheet aluminum is not to be had, use one of the fixed plates of an ordinary variable condenser, and saw out the radial teeth, as shown. The five-sheet unit is connected to the first point, shown at the left in the wiring diagram.

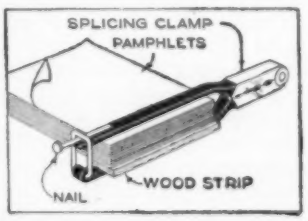
The cabinet is made from ¼-in. stock to the dimensions given, and the lead wires are brought to binding posts in the top. The cabinet should be finished to correspond to the finish of the other instruments. This condenser can also be back-mounted on the panel, instead of making it into a separate unit, if so desired.—F. L. Brittin, Chicago, Ill.




An Efficient Bridging Condenser That can Easily be Built at Low Cost and That will Work Well in the Ground Lead of Continuous-Wave Sets: It Works Nicely in Receiving Sets and can be Made in Various Capacities

### Clamp for Bookbinding

In casting about for a clamp to hold a number of loose pamphlets that were to be bound together in the form of a book, a pair of lineman's wire connectors was found to be just the thing. The connectors were a little wide between the handles for the thickness of the number of pamphlets, so a wooden strip was placed against one handle. The pamphlets were evenly placed and the other handle brought down and the clamp link sprung over the end. As the link did not hold the pamphlets together tightly, a nail was inserted, as shown, and the binding cloth applied.



# Making Bearings for Model Machinery

By HOWARD GREENE

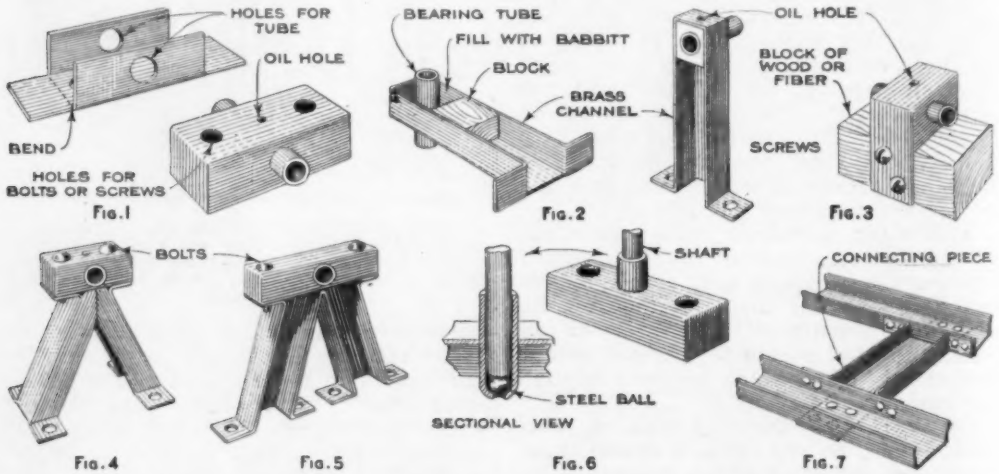
THE weak point of much model machinery is in the bearings, which are frequently made of pieces of sheet metal with holes drilled for the shafts. Brass channel-bar stock is much better for this work and is susceptible of a variety of treatment; it is much easier to work with than solid bar stock, as well as lighter and cheaper.

To make a plain bearing, as shown in Fig. 1, cut a piece of the channel to the length of the box, plus twice the height, or a little more, to allow for finishing up. Cut away the flanges at both ends for a distance equal to the height of the box, and bend the remaining strip at each end over until the ends are closed. For the actual bearing, a piece of brass tube of the right size is forced into the holes through the flanges, as shown. Leave the tube somewhat longer than the width of the box to improve the appearance.

Figure 2 shows a high bearing. Cut away the central part of a piece of the channel, called the web, and bend the flanges outward to form feet, then drill them for the holding-down screws. At the desired height drill for a bearing tube and force the tube in. The top of the channel is to be closed by cutting away the flanges for the necessary distance and bending over the web; then insert a wooden block in the channel, a little below the tube, and fill the space between the top and block with melted lead, babbitt, or type metal. File off the end of the tube flush with the webs on either side. If extra rigidity is needed, the bearing may have three feet, instead of two, by bending out the web instead of cutting it off. If desired, the hole for the shaft may be drilled through the babbitt filling, omitting the tube entirely. Another method of making a high bearing is to proceed as in Fig. 1, but the projecting parts of the web are made longer and run down the sides of a neat block of wood, or fiber, as shown in Fig. 3.

Quite an elaborate type of bearing is made as shown in Fig. 4. Two pieces of channel are cut and feet are formed as indicated; a single foot can be made from the web, if extreme rigidity is not an essential. The bearing itself may be of the type shown in Fig. 1. A variation of this construction is shown in Fig. 5, and this, in many ways, makes a better job, as far as rigidity is concerned.

A thrust, or bottom, bearing for a vertical shaft is made as shown in Fig. 6. A piece of channel is prepared as for the bearing in Fig. 1, but is drilled for the tube through the web instead of through the flanges. Before inserting the tube, one end of it is partly closed by turning over the edge, to hold a steel ball as large as the tube will accommodate. Put the tube in the channel, with the ball end flush with the edges of the flanges, and fill in the channel with babbitt, or solder the tube in place. The end of the shaft should be made perfectly square. If a lathe is available, chuck the shaft, perfectly true, and form a rounded end to




**The Bearings in Model Machinery Are Frequently the Weak Points. Brass Channel Bar Is Extremely Useful for Making Bearings That Are a Distinct Addition to the Appearance, Rigidity, and Durability of the Model. Figure 7 Shows How Pieces of the Channel Bar are Riveted Together**

bear against the ball, to secure the minimum of friction.

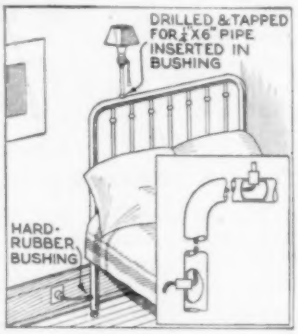
While channel stock is under discussion, it may be well to indicate a good way of attaching two pieces together. The connecting piece is split on the corners and the flanges are bent outward at right angles, the web being left straight. The flanges and webs are riveted to the parts to be connected with small brass rivets as in Fig. 7. Incidentally, the small brass nails known to the hardware trade as "escutcheon pins" make excellent rivets for such light work.

### Testing Height of Electrolyte

The electrolyte in storage batteries must be kept at a uniform height above the plates at all times for the most efficient operation; if the electrolyte is below a certain level, distilled water must be added to bring it up again. To determine when the cell is filled to the usual height of ½ in. above the plates while the battery is in position, and where the light is poor, a piece of glass tubing, about 8 in. long, can be used. The tube is inserted into the cell until it presses against the plates and the first finger is placed over the upper end. Holding the finger over the end of the tube, the latter is withdrawn, and the level of the solution held in it will indicate the depth to which the electrolyte covers the plates.

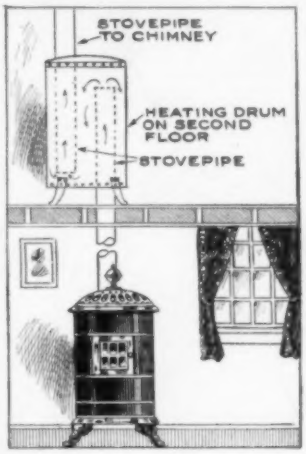
### A Convenient Bed Light

For the comfort of invalids, or those addicted to reading or writing in bed, the bed light shown in the drawing was devised. The actual installation is quite simple and consists in leading the electric-light wire through the tubular bedpost in the manner shown. A hole is drilled and tapped near the foot of one of the posts and fitted with an insulating bushing for the wire, which is passed through the post and out of a similar hole in the top of the bedstead. The latter hole is drilled and tapped for a bushing, into which a suitable length of ¼-in. pipe is screwed to form a support for the lamp. The outer end of the pipe is threaded and an ordinary chain-pull light socket is attached and wired. A plug on the end of the wires to the lamp is screwed into a flush-plug receptacle.—Truman R. Hart, Ashtabula, Ohio.




### Heater Made from Old Tank

The illustration shows how a discarded steel tank was put into service for heating a room on the second floor of a dwelling. Four legs were riveted to the tank and a hole was cut into each end just large enough to admit a stovepipe. The bottom stovepipe conducted the heat and smoke into the tank from the stove below, the pipe being inserted to within a few inches of the top. The smoke escaped through the second stovepipe which was inserted through the hole in the top of the tank, as indicated.



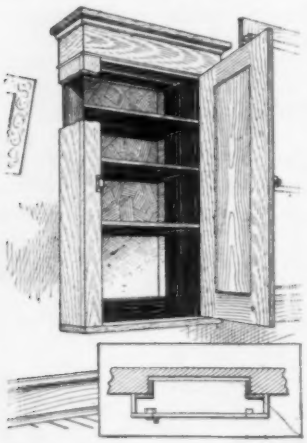

### Pipe Coils in Hot-Air Furnaces

The installation of a few coils of pipe in heating furnaces, to provide hot water, is quite common, but many are finding that the running in of the pipe into the firepot at the side of the dome, or heated surface, and out again to the water heater is more or less dangerous unless a tee connection is made on the lower pipe as it leaves the furnace, and a faucet screwed into the outer end of the tee.

The use of the faucet will eliminate all the common troubles of this method of heating water. The coil is bound to clog up more or less during the summer months, and when heated continually it is only a short time before serious damage will be done to the whole furnace. The faucet will permit frequent draining, and as these heating coils are usually of small-diameter pipe, cleaning is often an absolute necessity if the system is to work at all.—L. H. Georger, Buffalo, N. Y.

### Enlarging a Shallow Cupboard

A shallow cupboard, built into the partition separating two rooms, was enlarged to more than double its former capacity by the simple method illustrated, the finished work forming a distinct addition to the furniture of the room. In carrying out the work, none of the original cupboard framing was removed with the exception of the door, which was made to do service in the remodeled job without alteration. The new woodwork was fastened directly to the edges of the original woodwork, as shown in the plan view, thus increasing the width and height as well as the depth of the cupboard.—Philip Myers, Baltimore, Maryland.



### Lamp Made from Artillery Shell

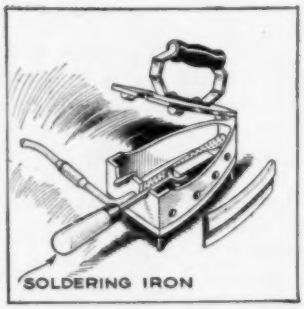
A soldier of the World War cherishes an 18-lb. artillery shell as a souvenir of his experiences, and this he has converted into the good-looking table lamp shown by the photograph. A hole was drilled through the nose and this was tapped to receive the supporting standard and lamp cluster. The base upon which the shell rests was turned from a piece of black walnut and appropriately finished.—Edgar Downie, College Point, N. Y.

### Sandpaper Used for Bushings

The following method of repairing a push-bit pipe, the joint of which had become worn and loose, proved very satisfactory. A small strip of sandpaper was cut to the proper size, and placed in the stem end of the pipe bowl, with the rough or sand surface out. The stem or bit was then fitted in, and as the thickness of the sandpaper made the bushing too thick, the stem was filed to fit. The rough surface of the sandpaper will prevent the bushing from coming out when the bit is removed for cleaning. Sandpaper bushings can be used for many purposes, such as repairing loose chair legs and the like.—R. B. Clifton, Denver, Colo.

### Gas Iron as Heater for Soldering Bit

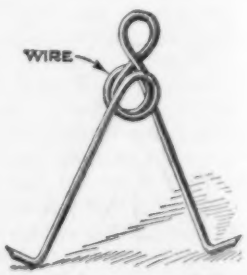
The drawing shows the manner in which I use an ordinary gas iron to heat a soldering bit. The fact that the iron is so used does not interfere with its service in the laundry. Therefore, either an old or a new iron may be used.




By turning the pipe to which the gas hose is connected to one side, the flame is forced directly onto the soldering iron. To help keep the heat in the gas iron, it is best to make two side-pieces similar to those shown; these are slipped over the sides and cover the air holes. If the openings in the back of the iron are too small to admit the tang of the soldering bit, it may be necessary to enlarge the hole a trifle by filing.—H. A. Gustafson, Chicago, Ill.

### A Simple Skinning Gambrel

For suspending the carcasses of small animals while removing the pelts, some form of gambrel is necessary. The drawing illustrates an original form of skinning gambrel which will not allow the carcass to slip during the skinning, with possible damage to the skin from unlooked-for contact with the sharp edge of the skinning knife. About 3 ft. of steel or brass wire is required to make such an article, which is easily formed by twisting around a stick or piece of tubing, bending the ends, and pointing.



# PRIZE OFFERS

## TROPHY FOR AIRPLANE EFFICIENCY

The last day of the aviation meeting held in connection with the International Aero Congress, at Omaha, November 3, 4, and 5, last year, witnessed the contest for the aerial-efficiency trophy, donated by John M. Larsen. The conditions governing the contest might be specified broadly as the demonstration of the air-going machine that is capable of carrying the heaviest load, at the highest average speed, with the lowest fuel consumption. There were 18 entrants in the contest, and the winner was officially declared to be Earle F. White, who was accorded 4,671 points, as compared with 4,640 points, the score of Max Goodenough, who was second with a Larsen airplane. The course of the contest was of an approximate length of 250 miles, and White did this with a total useful load of 1,160 lb., at an average speed of 97.21 miles an hour, and with a fuel consumption of 23¼ gal. The second winner carried 1,640 lb., at an average speed of 97.21 miles an hour, with a fuel consumption of 36 gal. The points were calculated on the basis of the ratio of fuel consumption to load and speed, and on account of alleged miscalculations in this connection, the donor of the trophy has taken out an injunction to prevent the Aero Club of Omaha from paying the official winner the $3,000 cash prize which goes with the trophy. The Larsen efficiency trophy, with an over-all height of 4 ft. 6 in., is a product of the sculptor's art, strikingly symbolical of what it rewards. Standing on a diminutive globe, made of silver, are two figures, also of silver, one representing a mechanic and the other an army airman. They are holding above their heads a small airplane, made of gold. A propeller mounted at an equatorial axis of the globe symbolizes the ability of air craft to move the earth.

**Larsen Trophy for Airplane Efficiency, Won by Earle F. White, at the International Aero Congress, at Omaha**

## NEW ORGANIC-CHEMICAL ASSOCIATION

With the designation "Synthetic Organic Chemical Manufacturers' Association of the United States," a new society has been organized to represent the several closely related lines of manufacture included in this branch of chemical industry. The association is subdivided into four sections: dyestuffs, pharmaceuticals, intermediates, and fine organic chemicals. The main purpose of the association is to promote the manufacture in the United States of all kinds of organic chemicals, and to coöperate with the government in its effort to develop a complete organic-chemical industry. The association will take such collective action as will best aid the establishment of the organic-chemical independence of the United States.

## OUTERS'-RECREATION OFFERS PRIZES FOR TRUE STORIES OR FICTION

For outdoor true stories, or fiction, on the subjects of hunting, fishing, camping, including auto camping, $3,000 in cash prizes is offered by Outers'-Recreation, as follows: First, $1,000; second, $600; third, $400; fourth, $300; fifth, $250; sixth, $200; seventh, $150, and eighth, $100. Manuscripts must be typewritten, double-spaced, on one side of the sheet only. The title of the story must appear at the head of each sheet, but the author's name must not appear on the manuscript. On a separate sheet, attached to the manuscript, must appear: the title of the story; name and address of the author, and number of words in the story. Manuscripts must be mailed flat between sheets of cardboard. If return of manuscripts is desired, postage for the purpose must be inclosed. The story must not be less than 4,000 words nor more than 6,000. No manuscript will be entered which is postmarked later than March 1. No more than one prize will be awarded any author. Address: Contest Editor, Outers'-Recreation, 9 S. Clinton St., Chicago, Ill.

## SCENARIO-STORY CONTEST FOR SCHOOLS OFFERED BY THE CHICAGO DAILY NEWS

A second scenario-story contest, similar to the first, announced in our November, 1921, issue, but open to school pupils only, is offered by the Chicago Daily News. The contest is open to all grammar-school pupils of the sixth, seventh, and eighth grades, and to all high-school students in Cook County, and the counties that lie wholly or partly within 100 miles of the city of Chicago. In each case the prizes will be as follows: First, $500; second, $250; third, $100, with additional prizes for the best scenario story in each grammar school in Chicago of over 250 pupils, one of $15 for the whole school, and one of $5 for each of the sixth, seventh, and eighth grades. There will be similar additional prizes for each high school in Chicago of more than 250 pupils, the $5 prizes being for each of the first, second, third, and fourth-year grades. In each grammar or high school outside of Chicago, there will be awarded 25 prizes of $15 each. Any scenario story submitted must be accompanied by a scenario-story certificate clipped from the Daily News, which must be signed by the teacher or principal of the school in which the student is regularly enrolled. The stories are not to exceed 2,000 words. All stories must be legibly written, or typewritten, on one side of the paper only. The contest closes for all schools on February 5, at midnight.

## AN INTERCOLLEGIATE EDITORIAL CONTEST IN INTEREST OF CULTURAL EDUCATION

In order to stimulate the interest in liberal arts of every male undergraduate in every college and university of both the United States and Canada, and also in order to refute the claim, sometimes advanced, that the four-year cultural course is time misspent, Pi Delta Epsilon, Honorary Collegiate Journalism Fraternity, has announced that for its 1921-22 intercollegiate editorial contest the subject will be "The Practical Value of a Cultural Education." President Harding, a member of Pi Delta Epsilon, former editor and present owner of the Star, of Marion, Ohio, will represent the fraternity in the presentation of awards. Three prominent metropolitan-newspaper editors will act as final judges. A local contest will be conducted at each college and university, and the first prize winner in this

contest will receive the "Certificate of Merit" of the fraternity, and will be eligible to submit his editorial in the national contest. Three prize winners in the national contest will be awarded the Pi Delta Epsilon gold, silver, and bronze medals. The contest is now open, and will close February 15, at midnight. Editorials submitted must not exceed 500 words, written in regular manuscript form, with an assumed name on the upper left corner of each sheet, and also on an accompanying envelope, in which should be sealed a paper bearing contestant's name, age, home city, class, and local address and telephone number. This is to be submitted to the local committee, who will forward it to the fraternity's contest committee, in care of P. C. Pack, 6415 Greenwood Ave., Chicago, Ill.

### REDMEN GAVE MASSASOIT MEMORIAL TO PLYMOUTH, MASSACHUSETTS

A statue of Massasoit, Wampanoag Indian chief, was presented last Labor Day to Plymouth, Mass., by the National Order of Redmen. Popular Mechanics, in describing this incident in the December magazine, page 840, mistakenly credited the presentation to the Society of Mayflower Descendants, having been misinformed by a contributor who had proved reliable theretofore. Minnie E. Burke, librarian, and a native of Plymouth, calls our attention to the mistake and gives us a very interesting account of the unveiling. "The memorial," she states, "was paid for by contributions from Redmen all over the United States. It was unveiled on Labor Day by an Indian woman, the last lineal descendant of the great chief. The Redmen held their national convention in Plymouth on that day, and she unveiled the statue at their invitation. The statue is a memorial to Massasoit himself, in recognition of his kindness to the Pilgrims, and not a commemoration of the first settlement."

### CIVIC INTERESTS PROMOTED BY NOVEL KIND OF CONTEST

With the object of promoting good municipal management, an original form of prize contest was instituted, last year, by a luncheon club of New Orleans, La. At the weekly gatherings, members were invited to submit suggestions in writing of work to be done in 1922 by the Association of Commerce. Prizes were awarded for the best suggestions. This provided the board of directors with much valuable material, when they met at the end of the year to arrange the 1922 program of the organization.

### AS SEMICENTENNIAL OF FIRST ARBOR DAY MAKE 1922 BANNER TREE-PLANTING YEAR

To celebrate the semicentennial of the first arbor day in the United States, held in Nebraska in 1872, the American Forestry Association calls upon women's clubs, civic organizations, and schools to make plans now for the spring tree planting this year. Its object is to make 1922 the banner year in tree planting.

### CONTESTS PREVIOUSLY ANNOUNCED

**Essays on Economics:** Prizes, $1,000 and $500; announced June issue, 1921; closes Dec. 31; address, Dr. Wm. T. Foster, Newton 58, Mass.

**Medals, Diplomas, and Money Awards:** Announced August issue, 1921; awards offered by the Franklin Institute.

**For Service to City of Philadelphia:** Prize $10,000; announced September issue, 1921; awarded in spring or summer of 1922 by Edward Bok, former editor of The Ladies Home Journal.

**Research Thesis by a Woman:** Prize $1,000; announced October issue, 1921; closes Feb. 25, 1922; address, Dr. Lilian Welsh, Goucher College, Baltimore, Md.

**Model in Clay by Students of Chicago Art Institute:** Prizes, $1,000, $100, and $50; announced November issue, 1921; closes April 15, 1922; address, Daily News Office, 15 N. Wells St., Chicago, Ill.

**Cash Prizes for Needlework:** Prizes, $200, and others varying from $100 to $1; announced January issue, 1922; closes, Jan. 31; address, Star Needlework Journal, 260 West Broadway, New York City.

**One Million Francs for Best Motor:** Announced January issue, 1922; closes June 1, 1923; address, Aero Club of France.

**Best Slogan Describing Razor:** Prize $500; announced January issue, 1922; closes June 30; address Durham Duplex Razor Co., 190 Baldwin Ave., Jersey City, N. J.

**Essays on George Washington:** Prizes, $2,500, and others from $500 to $25; announced, January issue, 1922; closes Feb. 22; address "Essays," Chicago Tribune, 7 S. Dearborn St., Chicago, Ill.

¶The small suspension bridge described on page 589 of the October Popular Mechanics Magazine is located at New Carlisle, Ohio, instead of Winchester, Ky. It is an attractive feature of Silver Lake Park, owned by H. S. Credlebaugh.

*In answering prize offers please mention Popular Mechanics Magazine*

## LATEST DEVELOPMENTS IN SCIENTIFIC RESEARCH

By C. A. BRIGGS

### TIDES RESPONSIBLE FOR PRESENT LIFE FORMS

The insignificant portion of the earth represented by the narrow strip along the ocean shore which is covered and uncovered by the tides, appears to have had a profound influence on the development of life on the earth, according to the studies of a zoölogist. He states that if life did not originate there, it at least in its earlier youth served an apprenticeship in the tides; and in its present forms it is continuing to show the effects of its early environment.

A curious influence of habit was noted in this connection in the case of a small flat worm which lives in large numbers on sandy beaches in some parts of the world. These small animals come to the surface when the tide goes out, and burrow down in the sand when the water rises and reaches them. When they are removed from the beach to the laboratory and placed in test tubes containing sand, it is found that they move up and down at regular intervals of time, just as though the tide were present. Perhaps in their wormish way they think they cause the tides.

### QUARTZ CRYSTALS FURNISH STANDARD FOR HIGH TEMPERATURES

It has recently been discovered that quartz crystals can be used to establish very accurately a standard high temperature for use in calibrating pyrometers, the instruments used for measuring high furnace temperatures, and the like. When a crystal of this material is heated to 573.3° C., or 1,063° F., a sharply defined critical point is reached at which there is a rearrangement of the molecules, and heat is absorbed, causing a kink to occur in the rate at which the temperature of the quartz rises, as shown by a thermocouple making contact with it. Specimens of quartz from all parts of the world have been examined, and this critical temperature has been found to be very nearly the same in all of them, the differences being less than .3 ° C. The variation given by any one piece of quartz on repeated trials gives results within the same limit.

This property of quartz crystals just discovered has an interest and value which extend far beyond the laboratory and into the practical field.

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